TWENTY-THIRD VOLUME.

FROM JANUARY TO DECEMBER, 1892, INCLUSIVE.

NATIONAL CAR AND LOCOMOTIVE BUILDER

TENEYCK

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

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INDEX TO TWENTY-THIRD VOLUME.

MISCELLANEOUS.

ILLUSTRATIONS.

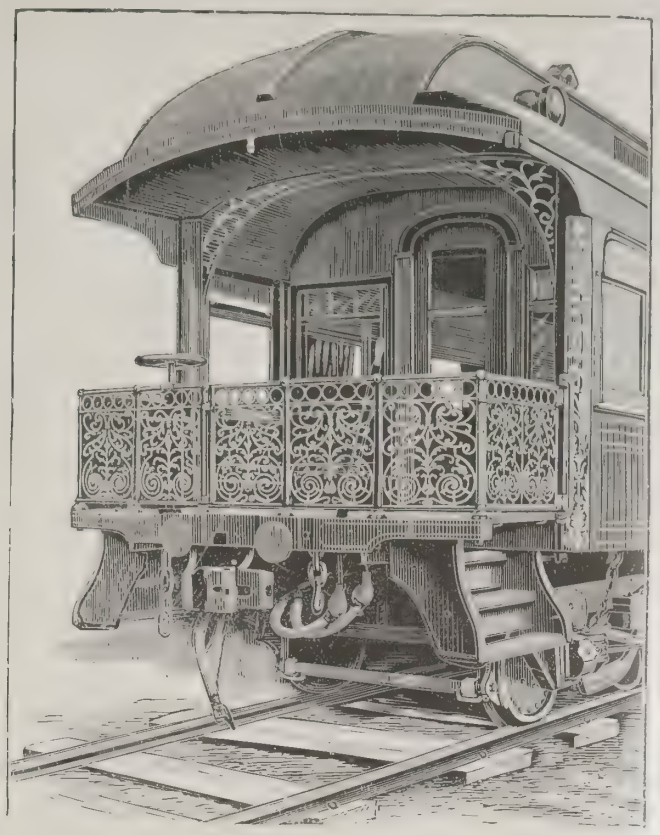
EDITORIALS.

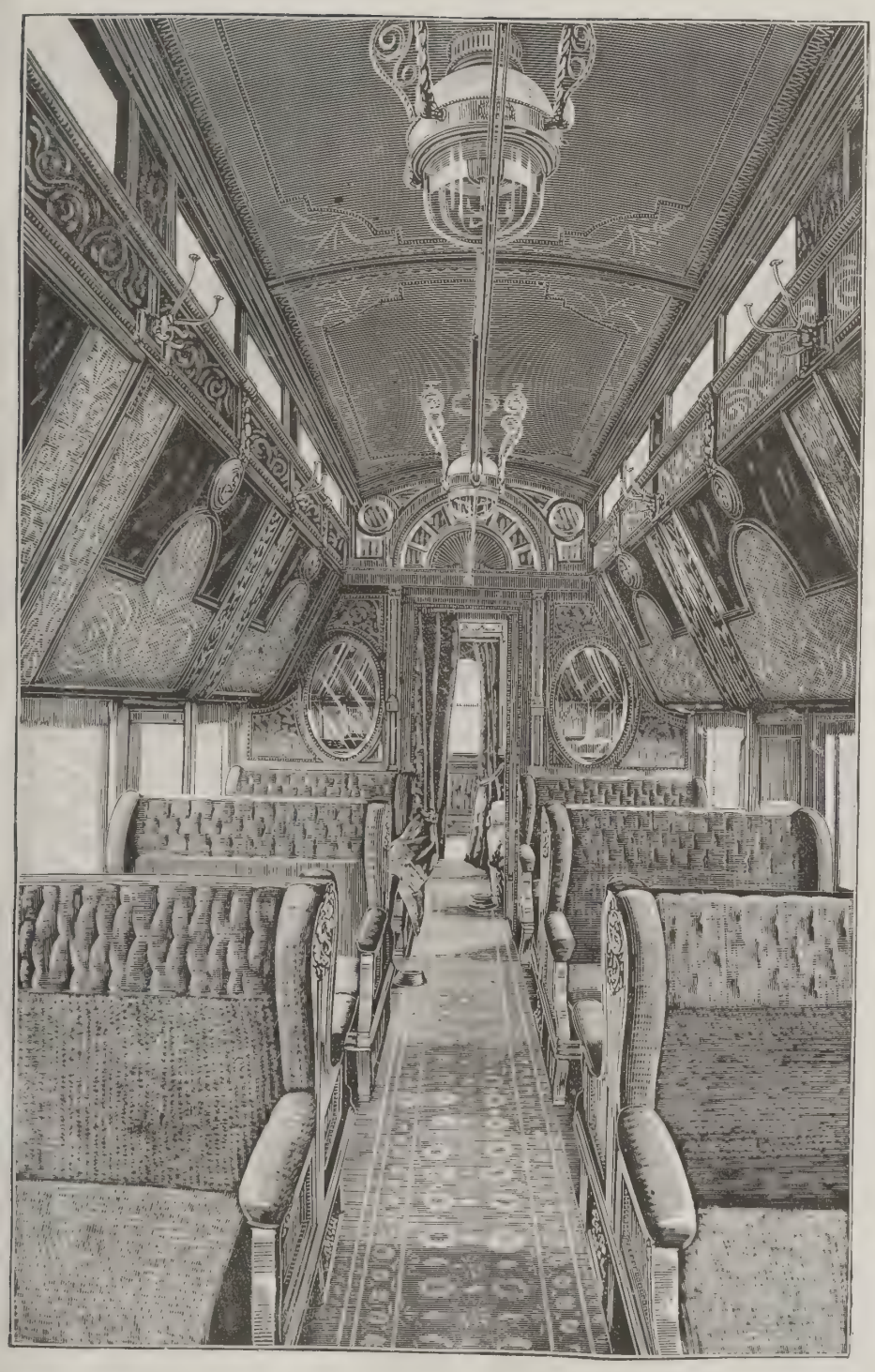
PARAGRAPHS.

COMMUNICATIONS.

LITERARY NOTICES.

TECHNICAL SOCIETY MEETINGS.





PULLMAN'S PALACE CARS.

BUILT BY PULLMAN'S PALACE CAR COMPANY.

PULLMAN, ILLINOIS. DETROIT. MICHIGAN.

NATIONAL CAR AND LOCOMOTIVE BUILDER

JANUARY, 1892.

CONTENTS.

The Harris Car Company has been incorporated in Put nam, Conn.

The Pittsburgh (Pa.) Locomotive Works will build a large machine shop.

Another great railroad tunnel is to be run through the Alps; it will cost $15,000,000.

The Norfolk & Western are about to erect machine shops at Lambert's Point, near Norfolk, Va.

The Chicago & North Western Ry. has purchased the Milwaukee, Lake Shore & Western Ry.

The machine, boiler and blacksmith shops of the Baltimore & Ohio, near Baltimore, were burned on Dec. 6.

The Great Northern is reaching out for the Pacific coast. And the Burlington is digging away in that direction.

The Andrews Anti-Friction Journal Company, of Syracuse, N. Y., has been formed for the manufacture and sale of journal bearings.

The Acme Railway Switch Company, of East St. Louis, has been organized to manufacture the automatic lock-geared railway switch.

Locomotive engines to the value of $2,802,000 were exported from the United States during the last two months, showing a rapid increase in the foreign demand.

The Cleveland, Cincinnati, Chicago & St. Louis are going to build a 20-stall roundhouse at Bellefontaine, O., which is to succeed Galion as a divisional terminal.

The Litchfield Car Company, of Litchfield, Ill., has within the past month taken orders for 1,500 box and coal cars. The company will add new machinery to its plant.

A fast line of steamers between Quebec and Liverpool is contemplated to run in connection with the Canadian Pacific and compete for Chicago business with the roads between New York and Chicago.

The Chicago Elevated Terminal Railway Company has purchased for $7,500,000 the right of way and all the real estate holdings of the Atchison, Topeka & Santa Fe Railway within the limits of Chicago.

The Illinois Central road has renewed its contract with the Pullman company for a period of 25 years. The Pullman company purchases the railroad company's interests in the cars owned under a previous contract.

The Grant Locomotive Works, Chicago, are expected to be completed and ready for work early this year. The capacity of the works will be 200 engines per year, and all modern appliances for construction will be used.

The St. Charles Car Company have delivered 150 60,000-pound capacity coal cars to the Texas Pacific. This company has also received orders for 100 Missouri Pacific furniture cars, 100 Iron Mountain furniture cars, and 500 box cars for the Santa Fe.

There are 1,400 men at work in the East Buffalo car shops of the Central; 250 more than are usually employed. This is the result of the rush of grain from the West. Cars are needed and the old ones are being repaired at the shops with all possible haste.

The number of work-people in Germany has increased about 5 per cent each year since 1882, and is now estimated to reach about seven millions. Since 1888 a general raise in wages has taken place in most German industrial districts, and amounts to between 10 and 25 per cent.

A count of the passengers on the railroad over the Brooklyn Bridge lately showed a total of 123,966 in one day. The greatest number going one way in a single hour was 14,818, to Brooklyn, between 5 and 6 P. M. Going the other way the greatest number was 13,129, in the hour from 8 to 9 A. M.

The thirty passenger cars now being built for the Chicago, Burlington & Quincy by the St. Charles Car Works are to be equipped with the Acme car lamp, manufactured by the Adams & Westlake Company. The work of building is progressing rapidly and 18 of these cars will soon be delivered.

Mr. Stickler, one of the World's Fair Commissioners from Germany, has landed in Hoboken, and has in his possession what is said to be the sword carried by Christopher Columbus at the time of his discovery of America. The sword belongs to the museum of Salzburg, Germany, and has been lent for exhibition at Chicago.

The Manhattan Elevated Railroad Company have contracted with the Pittsburgh Locomotive Works for the building of twenty new locomotives. Mr. Wightman has for years cherished an ambition to build some locomotives for the New York Elevated, and he has got there at last, as he generally does when he sets his mind on a thing.

The Souder Railway Freight Car Company has been incorporated at Newport, Ky., by John J. May, Philip Engelskirger, E. E. Hughes and others, The company has been formed for the purpose of manufacturing all kinds of freight cars for railways according to the patents of Jacob J. Souder, of Washington, D. C. The capital stock is $2,000,000.

The Pennsylvania is having 4,500 freight cars built. The contracts are awarded as follows: Michigan Car Co., 750; Peninsular Car Co., 750; Erie Car Works, 500; Buffalo Car Co., 500; Barney & Smith Mfg. Co., 500; Murray Dougal Co., Milton, Pa., 500, and the Terre Haute Mfg. Co., 500 cars. The company will build 1,500 cars at its shops east of Pittsburgh.

We are indebted to Mr. Willard A. Smith, chief of the department of transportation of the World's Fair, for a copy of a very admirable "Portfolio of the World's Columbian Exposition," published by the Winter's Art Lithographing Company, of Chicago. It contains 15 artistically drawn and colored views of the buildings of the Exposition, including a double page bird's-eye view of the grounds, with a page of concise description for each building.

F. A. Towle, a conductor on the Boston & Maine Railroad, is said to have traveled two million miles in that capacity. He entered the service as a brakeman in 1847, and has been a passenger conductor continuously since 1851. He has averaged about 900 miles a week (equivalent to nearly twice around the globe every year), and has never had a serious accident to any train he had charge of.

A National Sleeping Car Company has been formed by St. Petersburg capitalists to introduce cars of the American style on the Russian railroads. A number of such cars have been ordered at the Putilovski factories. The wood frames and architectural plans were brought from the United States, and a staff of competent engineers was appointed to superintend the construction of the vehicles, so that the heating and ventilation shall be of the best approved kind.

Electricity describes a "penny in the slot" electric light which is being introduced into the railroad carriages on English roads. The lamps are placed in a convenient position to throw a good light on the book or paper. To the side of the car is attached a box containing the accumulator and mechanism for switching the current on and off. By dropping a penny into the slot the light is set going for 15 minutes, at the end of which time the circuit is automatically opened and the light extinguished.

One rather remarkable event lately in connection with the lumber trade was the arrival at New York of the schooner "White Cloud" with a cargo of lumber from Chicago. So far as known the "White Cloud" is the first sailing vessel to reach New York from the inland lakes. She made the trip in sixty-six days, touching at Montreal and Portland, Me. She passed through the Welland canal to reach Lake Ontario and after traversing that lake sailed down the St. Lawrence River.

Transatlantic travelers may soon feel an additional sense of security during the voyage, as it is said that the principal steamship companies have agreed upon a uniform ocean route for all steamers leaving Liverpool for New York, and another separate route for steamers sailing from here to Liverpool. Ocean lanes are not entirely new things. But to reduce the danger of collision to a minimum it is necessary that every steamship company should become a party to the agreement to use the chosen routes.

It is said that the only way for the government to save the timber lands of California from destruction is to withhold all mountain timber lands now unsold and make a series of reservations from Shasta to the new Sequoia Park. All the high Sierras about the Yosemite must be reserved soon, or the timber will be ruined. As it is, the timber is becoming so thin on these high plateaus about the Yosemite that the snow melts rapidly, and most of the waterfalls in the famous valley are dry by midsummer.

The Great Northern shops at Great Falls, Mont., will be built on a site about one mile from the passenger station The contract for building the first section of the plant has been let to James Carlisle & Sons, of Minneapolis, Minn., who are to complete the work this year. The buildings under contract are machine, engine and boiler shop, 140 feet by 150 feet; storehouse and office building, 40 feet by 100 feet and a 20-stall roundhouse of the company's standard plan. All of these buildings are to be brick, with pitch and gravel roofs.

The Baltimore & Ohio Railroad Company has encountered great opposition in laying a third track through the town of Brunswick. A protest from the town council was served, but no attention was paid to it and the men were ordered to work. A crowd of citizens tore up the track as fast as it was laid. The number of workmen soon became too great for any successful opposition, and the track was placed in position. During the trouble pistols were fired and dynamite exploded. When the track was being laid in front of Red Men's Hall a stick of dynamite exploded, injuring two men badly.

Mr. James Dredge, editor of *Engineering*, of London, on the 9th inst., read a paper before the Society of Arts, of London, on the Columbian Exposition, which was by far the most exhaustive study of the enterprise yet put into shape, and leaves no detail untouched of either the present plans, the condition, or the future prospects. The Attorney-General of England, who presided at the meeting, on its conclusion extended the thanks of the society to Mr. Dredge for the service he did at Chicago last summer, on which occasion he was accompanied by Sir Henry Wood, secretary of the British commission.

A Pennsylvania railroad official is quoted as saying: "Probably no road in the country has given the matter of placing such guards and offering such inducements to passenger conductors to make them honest as this company. I have been with the road over twenty years, and in a department where I knew every step which was taken in this direction, and the wisest heads have worked on the problem, and finally come to the conclusion that paying conductors good salaries was one of the most important things. Our conductors receive from $125 to $145 per month, and such pay makes them appreciative."

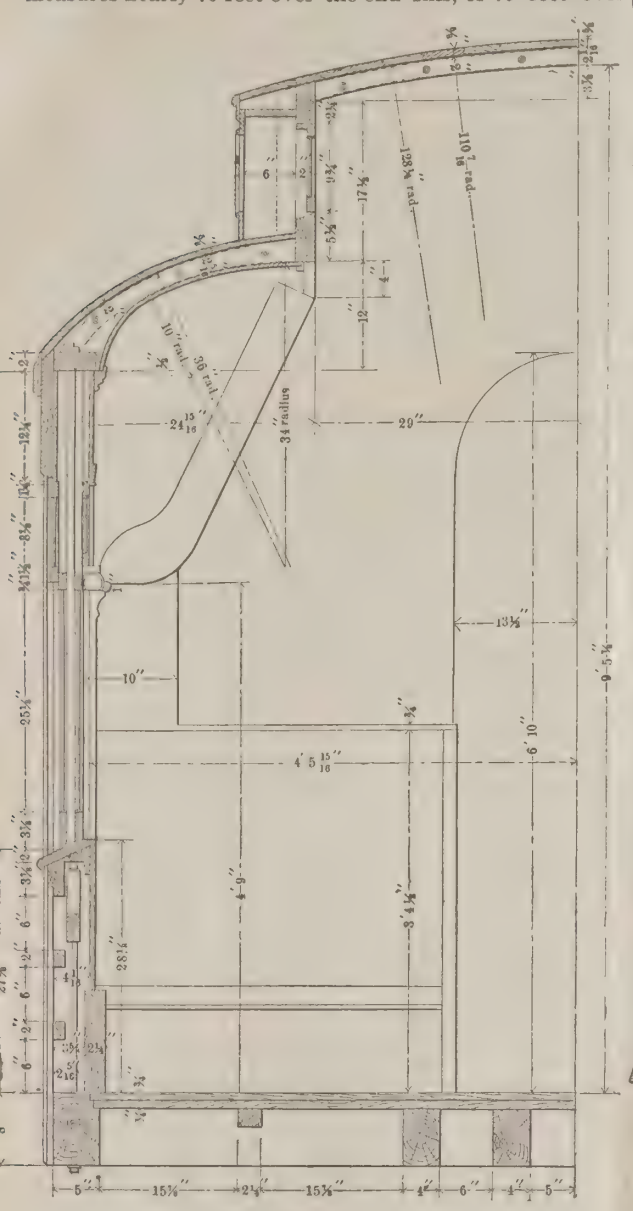
The old and partly demolished ferryhouse, the new and partly completed waiting room, the new train shed and new office building of the Pennsylvania Railroad Company, in Jersey City, were damaged by fire to the amount of $20,000 on Dec. 4. The greatest damage done by the fire was in the office building. The offices of General Superintendent Jackson and Division Superintendent Crawford were burned out, and the rooms occupied by Chief Engineer Brooks were also reduced to ruins. The train and ferry service was resumed at 6:35 p. m., and the Philadelphia express started but eight minutes late. The cause of the fire is not known, but it is generally believed to have been caused by an electric light wire.

According to the report of the general superintendent of the Railway Mail Service the rolling stock of the railway postoffice lines consists of 500 whole cars in use and 110 in reserve; 1,781 apartment cars in use and 500 in reserve, making the total number under control of the Department 2,891. At the close of the fiscal year there were 1,088 railway postoffice lines in operation, on which 5,514 postal clerks were employed in the separation and distribution of the mails. They distributed 8,546,370,090 pieces of ordinary mail, and receipted for, recorded, protected and distributed 16,671,914 registered packages and cases. On July 1, 1890, there were in operation 154,779.35 miles of railroad over which mail trains were run' to which were added during the year 4,738.65 miles of new service, being an increase of 3.06 per cent.

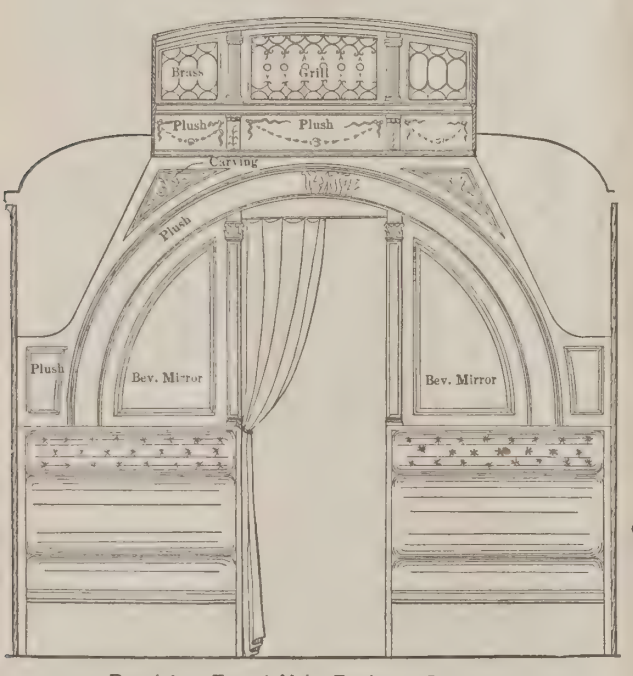
In a case of suit for $20,000 damages against the Chicago & Northwestern, recently before Judge Gresham, it appeared that the plaintiff, who was injured in an accident, had been hunted up at the hospital by an attorney, to see if there was any basis for a damage suit. Addressing the attorney Judge Gresham said: "I don't say you were guilty of shoving your services on this man unsolicited. But it looks bad, sir, very bad. If railroad trains run over people or injure them they should be held accountable for proper damages. But I don't like the way lawyers of a certain class have of rushing off to people as soon as they are injured, and forcing their legal services upon them; and the public does not like it either. Lawyers that do this sort of thing ought to be disbarred, and if I ever get another one of them before me I will disbar him."

Pullman's Palace Car Co. Standard Sleeping Car.

The engravings and insets herewith show the latest design of sleeping car as built by the Pullman company. Referring to the general arrangement drawings, the car measures nearly 70 feet over the end sills, or 76 feet over the vestibules, and 9 feet 8 inches over the side sills. It contains, in addition to the 12 sections of ordinary lower and upper berths, a drawing room with annex toilet, a combined smoking and gentleman's toilet room, a ladies toilet room, a heater room and a number of lockers. The car weighs nearly 50 tons and costs, inclusive of furnishings, about $18,000.



Cross Section.



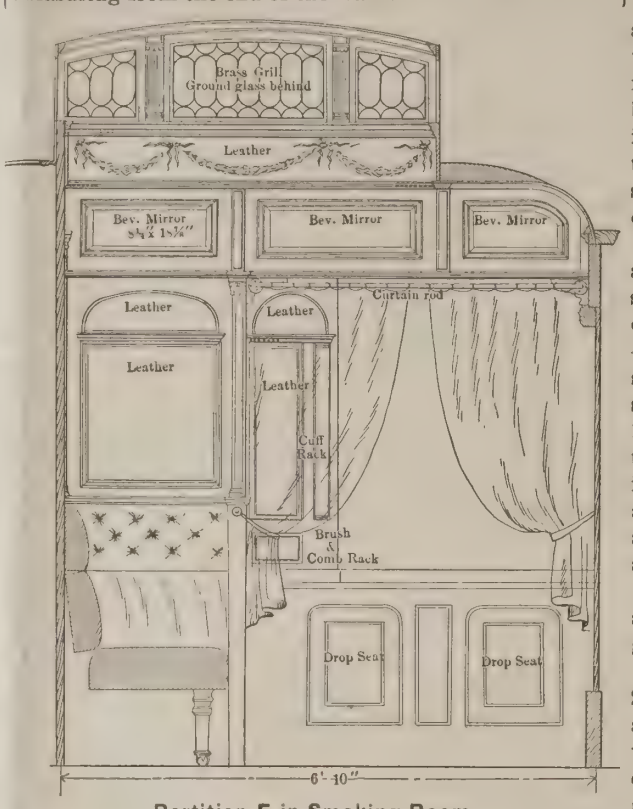
Partition F and H in Body o Car.

FLOOR FRAME.

Owing to the extreme length the center and intermediate timbers or sills are usually spliced: these are 4 inches by 6½ inches in size, while the side sills are 5 inches by 8 inches, the floor being flush with their upper edge. The floor, which consists of two thicknesses of ⅛-inch matched boards, is applied diagonally and in such a manner that the joints in one course cross those of the other at right angles. As the intermediate sills are placed nearly three feet from the side sills to make room for the 42-inch wheels with which these cars are equipped, an additional support for the floor is provided in the nailing strip, which is framed to the lateral distance pieces. The end sill is also rabbeted to received the floors, but is otherwise framed and fastened in the usual manner.

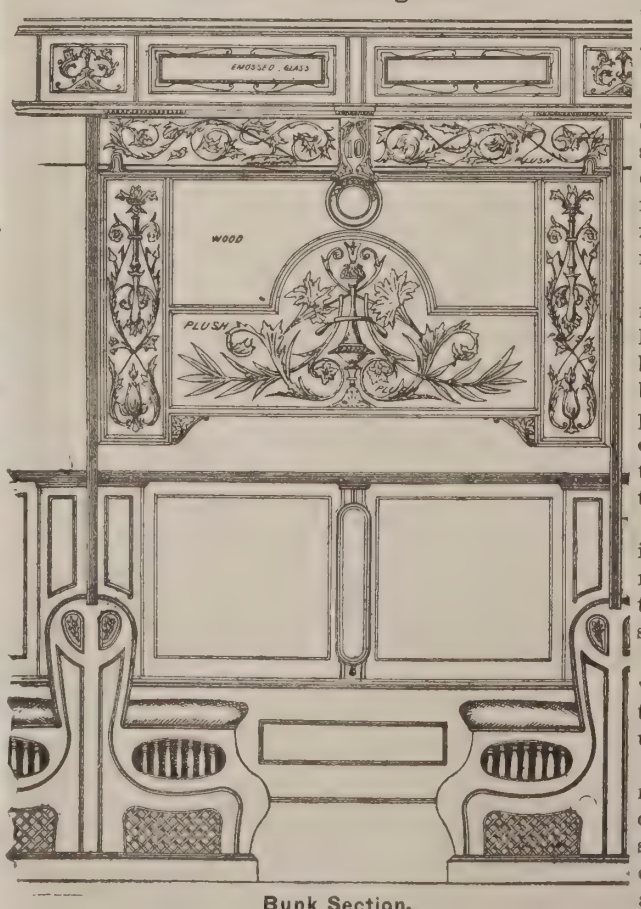
There are four trussed needle beams, located as shown, two of which simply acting as ties; they are also attached as customary.

The body bolsters is of the double variety, and is constructed with 6-inch tension and compression bars; it is located 5 feet 4½ inches and 10 feet 7½ inches, respectively, measuring from the end of the frame.



Partition E in Smoking Room.

Partition C in Smoking Room.



Bunk Section.

The two body truss rods are located immediately under the side sills, the ends being attached by means of pins to suitable irons securely bolted to the under side of the sills near the second bolster.

SUPERSTRUCTION.

The bracing in the side walls of this car is very strong and may be said to be a combination of the leading methods, both the A brace, together with the inverted truss rod for holding up the corners, and the short diagonal braces with hook rods being employed; in addition to this it was found necessary, since the vestibule has been added, to block the spaces formed by the uprights and nailing strips, for a distance of about 13 feet, measuring from the end sill back.

The members of the A brace are 1½ inches by 6 inches and 1½ inches by 7 inches, let in flush with the posts; the short diagonal braces 1½ inches by 4½ inches and their accompanying rods ⅝ inch and the long inverted truss rods ½ inch by 2 inches; the latter are supported on cast iron struts located between the bolsters. The remainder of the side-frame is constructed with a 2 inch by 5½ inch plate, 1¼ inches by 4 inches and 2½ inch by 4 inch posts, ⅝ inch tie-rods, a 2½ inch by 11½ inch truss-plank, a 2 inch by 4 inch belt rail, 1½ inch by 2 inch nailing strips and ⅞ inch and 1½ inch firring blocks. The letter board, which has an effective cross-section equal to 1¾ inches by 15 inches also adds some to the strength of the side-frame.

The exterior is covered with ⅝-inch narrow, matched and beaded strips which are carefully attached both with glue and nails.

The roof is framed with 2 inch by 5½ inch deck sills, 2 inch by 4½ inch deck plates and 1¼-inch rafters, which are spaced about 12 inches apart; at the points where partitions are located, there are 2-inch cross-carlines and at every section a ½ inch by 2 inch iron carline. The roof sheathing is ⅝-inch matched stuff; the covering is tin.

The exterior is painted with the dark shade known among car builders as the Pullman color, and is elaborately ornamented in gold leaf. The windows are made to appear large by finishing the woodwork, which separates each pair, in natural wood color same as the sash and by making one transom light for each pair of windows; this transom light is embossed and partially backed with silver leaf so as to hide the construction back of it.

INTERIOR.

The interior of the Pullman car is noted for its elaborate and artistic treatment. In the main room the woodwork, which is of mahogany, is less prominent than formerly, most of the panels being of embossed silk plush of a harmonizing shade; referring to the drawings showing the bunk section and the partition at either end of the room, in the former about one half of the bunk front, nearly all of the belt below the deck windows, the panels between them and in the latter the arch and small panels at each side of this, are so treated.

There is a small bevel-edged mirror between the windows in each section and a large one on each side of the opening in the partition. The space above the partition, and between this and the ceiling, is partially stopped by bevel edged plate glass mounted in brass frames, and partially by an open bronze grill.

The ceiling is of three ply veneer, painted a light shade and ornamented partially in relief.

The high-backed seats are covered with embossed plush of the same shade as that in the panels. The lamps and other trimmings are of bronze of a quiet pattern. The curtain rods which were formerly so prominent, are now so arranged that they can be concealed when not in use. The floor is covered with a rich carpet of a special pattern and harmonizes with the finish and the other furnishings of the room.

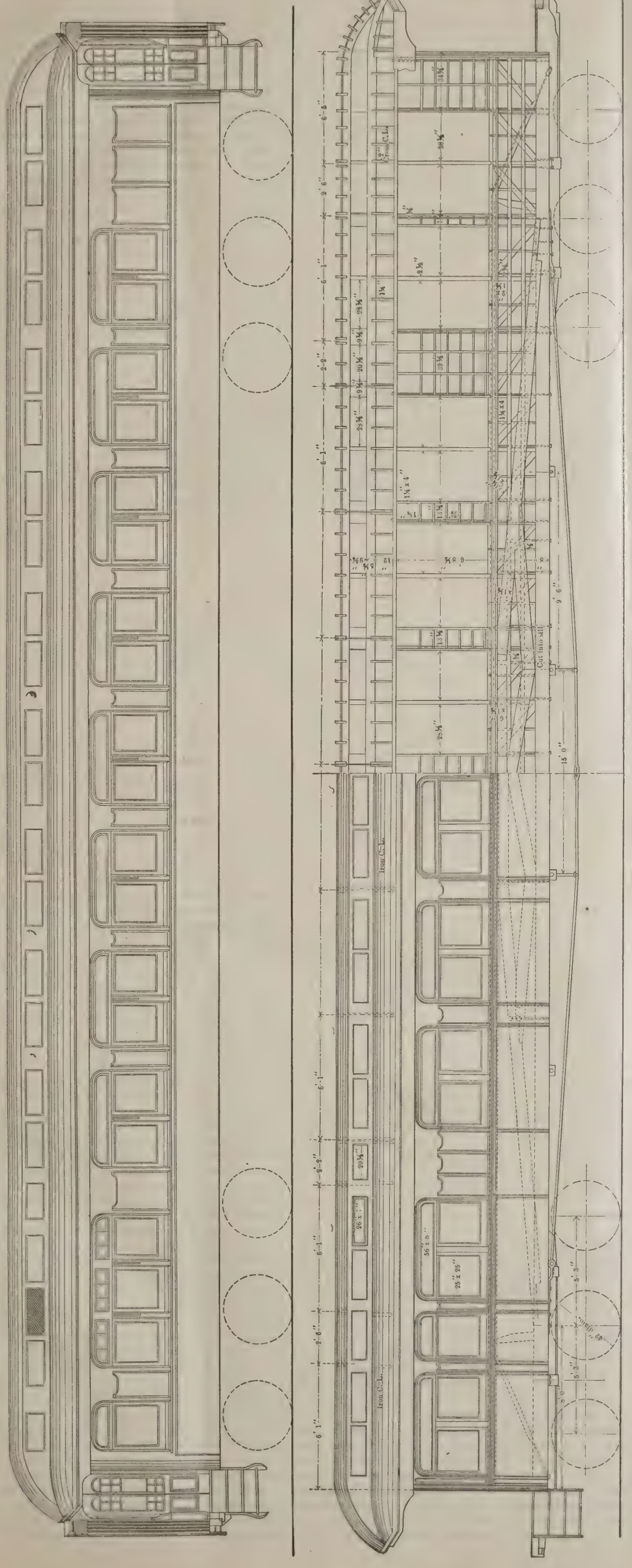
The drawing-room differs from the main room in the details of the partitions only. As there are no bunks in the smoking room, the style of the finish in this is somewhat different; the wood work is of English oak, which is relieved by panels of stamped leather and bevel-edged mirrors, which latter, as this room is also used as a toilet room, are rather numerous.

The passages, saloons, etc., are not nearly as elaborately finished as the rooms above mentioned; still they are in keeping with the general design. The wash stands and bowls are of silver plated sheet brass, and are supplied with both hot and cold water, which is carried in tanks suspended from the bottom of the car body. By admitting compressed air, which is obtained from the locomotive through the air brake pipe, above the water, this is forced through the pipes to where it is required.

The car is warmed by a Baker heater, which, as the car is so large, has two circulating coils. Cars running over roads where steam heating is employed are arranged so that the water in the heating pipes can be circulated by steam.

Ventilation is provided for by opening the deck windows, which are hung with ratchet pivots in the ordinary manner; the supply of air, formerly admitted through the screens under the platform hood, is cut off by the vestibules.

Ordinarily, the cars are lighted by Hicks & Smith mineral sperm oil burning lamps, which are set in chandeliers attached to the ceiling of the car and distributed as shown in the plan; the total number of lights is 26. In quite a number of instances the Pintsch light is employed and in some cases incandescent electric lights.



PULLMAN'S PALACE CAR COMPANY STANDARD SLEEPING CAR.

Notes on Locomotives for High Speeds.

BY ARTHUR T. WOODS.

In view of the apparent renewed interest in high speeds on railroads and the frequent and sweeping statements made by enthusiastic promoters of electrical traction in regard to the limitation of steam locomotives and the possibilities of electric motors, it may be of interest to examine the locomotive of to-day in some detail to see in what ways its capacity is limited and what changes are necessary to make higher speeds practicable.

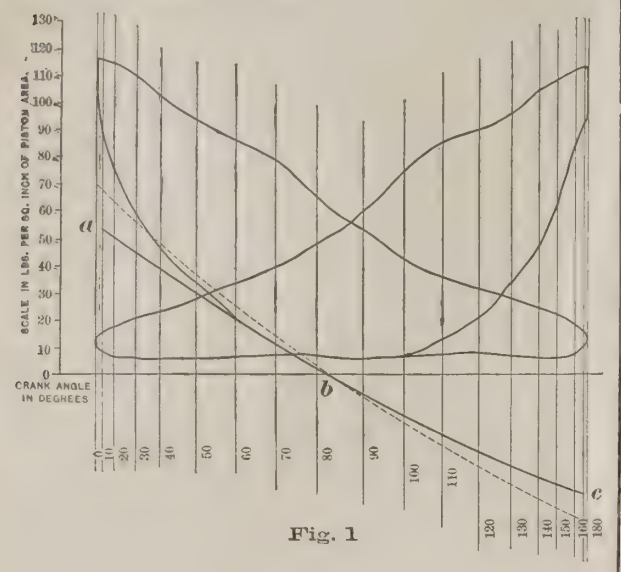


Fig. 1

The action of the reciprocating parts naturally claim our attention first. In Fig. 1 are shown indicator diagrams from a locomotive at 250 revolutions, together with a curve *a b c*, showing the pressure necessary to accelerate the reciprocating parts. The ordinates of the curve *a b c* represent pressures per square inch of piston. This figure is reproduced from a paper presented before the American Society of Mechanical Engineers (Vol. XI.) by Professor Jacobus, which is the most complete exposition of the influence of inertia in the steam engine of which the writer has knowledge. In Fig. 1 from 0 to about 83 degrees, where the acceleration line crosses the atmospheric line, the inertia of the reciprocating parts acts against the piston, and work is being absorbed by or stored in them, but from 83 degrees to 180 degrees, the work stored during the first part of the stroke is given out again. The effective steam pressure in the cylinder at any point in the stroke is, of course, the difference between the forward pressure of one card and the back pressure as shown for the same piston position by the other card. The effective pressure which is transmitted to the cross-head and crank is the difference between the pressures determined in this way and those shown by the curve *a b c*. These last pressures when transferred to the crank pin can be resolved into tangential pressures which produce rotation, and radial pressures which only affect the counterbalance.

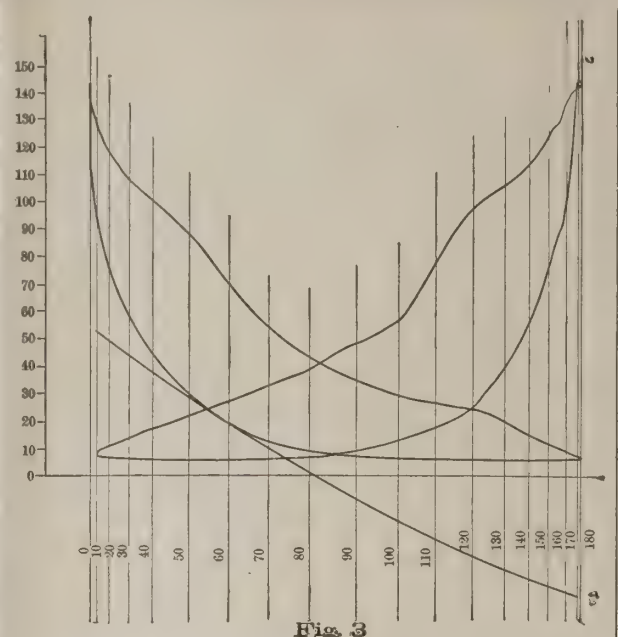


Fig. 3

combined curve *b b*... *b* shows a maximum variation of but about 15 pounds per square inch. Carrying this still further, we get for 445 revolutions per minute the curves *C C*....*C*, *C′ C′*....*C′* and *c c*....*c*. The reciprocating parts of each side are now dragged around by the other side for about 55 degrees during each stroke, the opposing pressure at the crank pin reaching about 25 pounds per square inch of piston, while there is about the same variation in the combined curve *c c*....*c*. It is apparent that, neglecting friction, the only limit to speed in an engine having two cranks at right angles on account of the reciprocating parts, is the strength of the parts, for the piston of one engine is always in a position to drag the other when the steam pressure on the latter is insufficient to accelerate it and its connections. But the maximum speed at which the engine would work satisfactorily, that is, without severe racking strains, is that at which the effective steam pressure on the piston is just sufficient to accelerate the parts, or in this case at about 350 revolutions. The locomotive from which this diagram was constructed has 18½ × 24 cylinders, and the weight of the piston, piston-rod and crosshead is 474 pounds, and that of the connecting rod is 307 pounds.

The pressure necessary to accelerate the reciprocating parts varies nearly as the weight of the parts, the stroke of the piston and as the square of the speed of rotation. An increase in the number of revolutions per minute, therefore, produces much greater changes in the distribution of pressures than an increase in either of the other variables. The effect of a reduction of 20 per cent. in weight at 250 revolutions per minute is shown in Fig. 2 by the dotted line *A A A*, from which it appears that the effect of this reduction upon the effective crank pin pressures at this speed is of small consequence. But it is evident that the same change of weight would produce an important change in the curve *B B*....*B*, or at 350 revolutions.

To illustrate the effects of a change in steam pressure and in steam distribution, indicator cards taken at about the same speed, 250 revolutions, but with higher initial pressure and earlier cut-off, are shown in Fig. 3. The weight of reciprocating parts has been assumed to be the same as before and Fig. 4 has been constructed from these data. In this figure, the curves *A A*.....*A*, *A′ A′*..... *A′*, and *a a*.....*a* are for 250 revolutions, the curves *B B*.....*B*, *B′ B′*.....*B′*, and *b b*.....*b* are for 385 revolutions, and the *C*, *C′* and *c* curves are for 445 revolutions per minute.

Comparing Figs. 2 and 4, it appears that at 350 revolutions for the first indicator card and at 385 revolutions for the second, the effective pressure on each crank-pin is practically nothing for from 20 degrees to 30 degrees from the dead point. These are, therefore, the maximum speeds at which the locomotives will work satisfactorily, as has been said, and the higher practicable speed for Fig. 4 is clearly due to the higher initial pressure. In Fig. 2 it was shown that at 250 revolutions a reduction of 20 per cent. in the weight of reciprocating parts made but little change in the tangential crank-pin pressures, but if a similar reduction of weight were applied to the curves *B* and *B′* in Figs. 2 and 4 the effect would be proportionately greater. For instance, in Fig. 4 a reduction of 20 per cent. in weight would result in a curve similar to *B B*.....*B* at about 430 revolutions, or would permit an increase of nearly 12 per cent. in speed without material change in the turning moments.

We see then that, on this basis, a speed of 385 revolutions is practicable for the locomotive having reciprocating

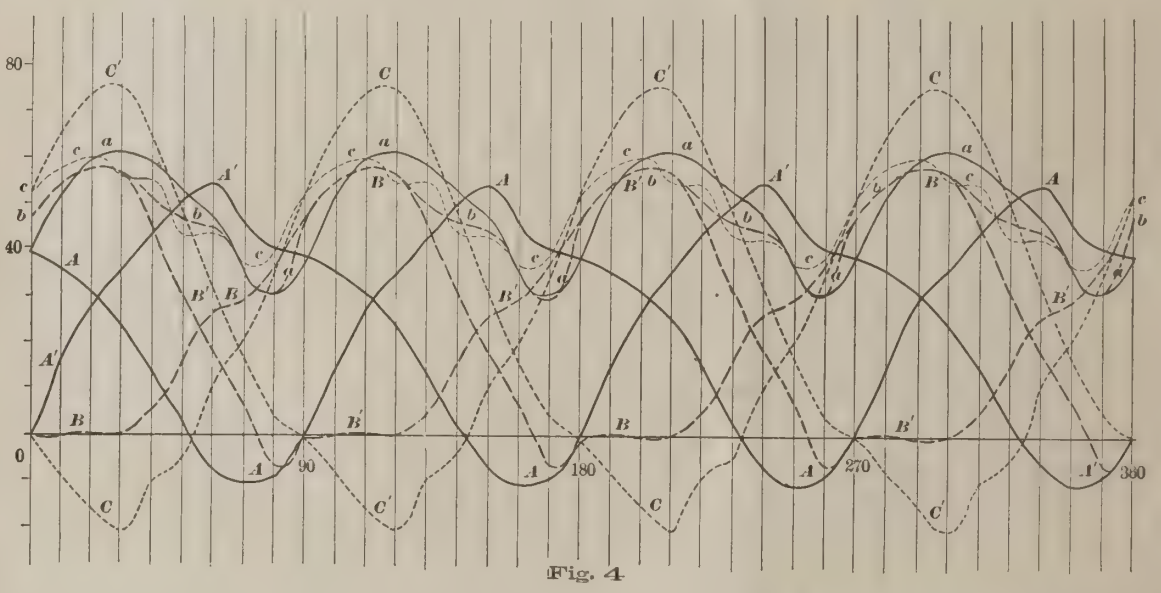


Fig. 4

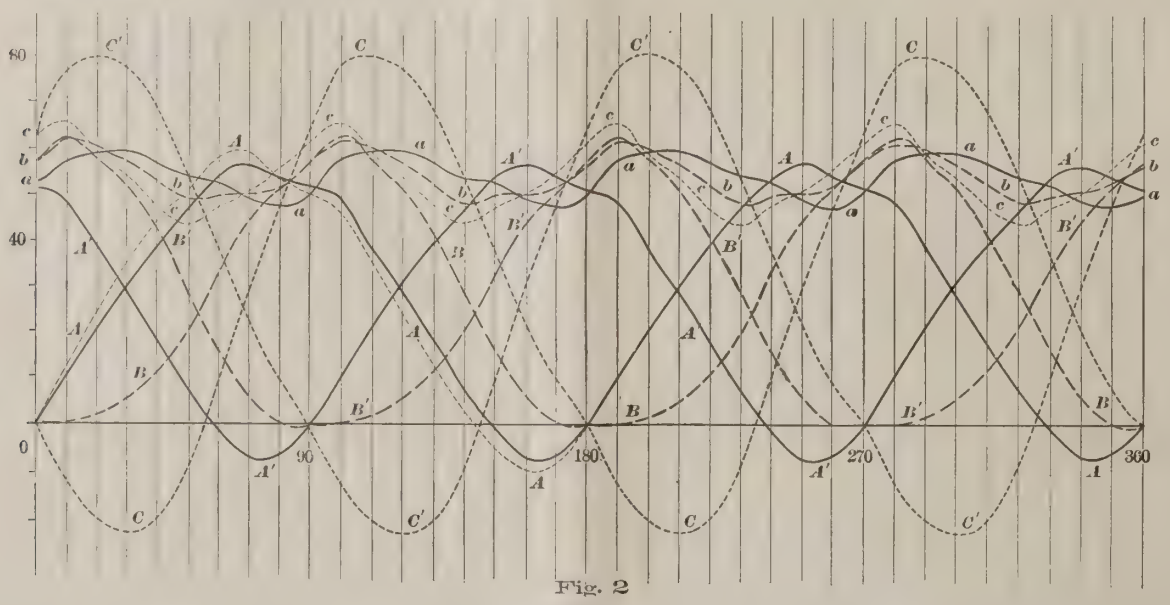


Fig. 2

In Fig. 2 are plotted the actual tangential pressures acting on the crank pin for each 10° during a revolution. The full line *A A*....*A* corresponds to the diagram in Fig. 1, the scale of Fig. 2 being 40 pounds per inch per square inch of piston area. It will be seen that for about 30 degrees from the end of the stroke the pressure is against the motion of the piston, and this is, of course, due to compression. The line *A′ A′*....*A′* represents the pressures on the opposite crank pin, at right angles with the first. Now, combining these two curves, we get the curve *a a*....*a*, which shows the actual variation in the turning power or in the tractive power during the revolution. The maximum variation shown by this line is only 12.5 pounds per square inch of piston. Now, suppose that the speed is increased to 350 revolutions per minute and that the same indicator card is obtainable. The tangential pressures on each crank pin at this speed are shown by the curves *B B*... *B* and *B′ B′*....*B′*. In this case the effective pressure is nearly zero for about 10° on each side of the dead points, but the parts as above, which would give an indicator diagram like Fig. 3, and further, to make higher speeds practicable, the possible changes to be made are, lighter reciprocating parts, a shorter stroke and higher steam pressure. The speed in miles per hour and the tractive force developed of course depends upon the diameter of the driving wheels. The horse power developed in the present case with 18 × 24 cylinders is about 890. With 68-inch drivers the speed would be about 77 miles per hour, and 89 miles per hour with 78-inch drivers. The total tractive power is, in the two cases, 4,290 and 3,740 pounds.

To increase the tractive power at this speed it is clearly necessary to increase the total mean pressure acting on the piston, which can be obtained by means of higher initial pressure, less loss by wiredrawing during admission, less back pressure, greater piston area, or all of these combined. Taking these items in order, the higher initial pressure can be obtained by higher boiler pressure, large and straight steam passages and absence of throttling. To reduce the loss by wiredrawing the possible means are multiple ported valves, or large valve travel, that is considerable over-travel in full gear. A low back pressure can only be obtained by straight and clear exhaust passages, large exhaust nozzles and a properly proportioned smokestack.

The question of larger cylinders for a given weight of engine brings us to another phase of the problem, which is the boiler capacity. To illustrate, suppose the indicator card of Fig. 3 to be from one of the New York Central express locomotives which have recently been illustrated in these columns, and which would then develop about 993 horse power at 385 revolutions per minute. If we assume 25 pounds of water per horse power per hour, the evaporation must be at the rate of 13.6 pounds of water per hour per square foot of heating surface, and, on the basis of six pounds of water per pound of coal, the rate of combustion must be 151.5 pounds of coal per square foot of grate per hour. While this rate of combustion has been exceeded, it is not likely that it could be maintained for a long run with ordinary coal, and if not the boiler must be enlarged to make the maintenance of such rate possible, or else the steam must be used more economically. A larger boiler of course means greater weight, and as at this speed the tractive power is now only about one-nineteenth of the

weight on the driving wheels, an increase in weight is not desirable.

The other alternative, viz., to use the steam more economically, is possible by the application of the compound principle. As the net effective pressure per square inch of piston in a compound engine at the beginning of the stroke is necessarily less with ordinary pressures than in a simple engine, it is to be expected that with the same relative weights of reciprocating parts the maximum practicable speed of revolution will be less than for the simple engine. To illustrate the action of the reciprocating parts in compound locomotives, Fig. 5 has been prepared from indicator diagrams taken at about 250 revolutions per minute from two two-cylinder compounds, one American and the other English, and one four-cylinder compound. The scale used is the same as in Figs. 3 and 4, the ordinates

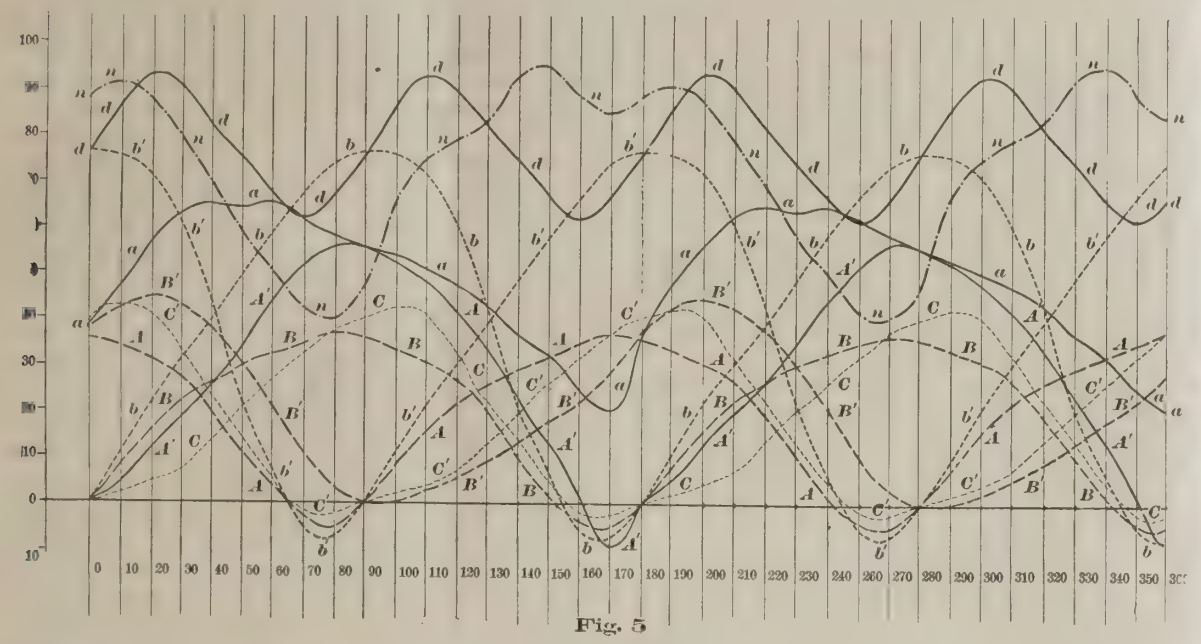


Fig. 5

representing the actual tangential forces acting on the crank-pins in pounds per square inch of piston of a corresponding simple engine; that is, all are reduced to the same scale as nearly as practicable. The curves A' B' and a are from the English locomotive, A' being from the high pressure cylinder, B' from the low pressure, and a the combination of the two. The curve n is the combined curve for the American two-cylinder compound. In the English engine somewhat more than one-half of the total work was being done in the high pressure cylinder, while in the American engine about 70 per cent. of the total work was being done in the low pressure cylinder. The remaining curves in Fig. 5 are from a four-cylinder compound of the Vauclain type. Curves C and C' are from the high pressure cylinders; B and A are from the low pressure cylinders; b and b' are the curves for each side of the engine, the high and low pressure being combined, and d is the combination curve for all four cylinders. It is at once apparent from these curves that the combined curve for the four-cylinder engine is much more uniform than for the others, and that, as shown by the steepness of the curve b, a much greater increase in speed is possible with four cylinders than with two on the basis of the indicator cards used. While general conclusions must not be drawn from an examination of a few indicator cards, it is exident that four-cylinder locomotives of the Vauclain, Johnstone, or tandem form have an advantage in uniformity of tractive power at high speed, which is due to the fact that variations in pressure between the high and low pressure cylinders affect the loads on the cross-heads and piston-rods, but are not transferred directly to the crank-pins. Also, as each crank-pin receives the combined pressures from a high and a low pressure piston, the maximum practicable rotative speed is higher in this type of engine. The variations in tractive power during each revolution are therefore very similar to those in simple locomotives, and therefore locomotives of this type can be nearly as well adapted for high speeds as simple locomotives, with the great advantage that on account of the reduced steam consumption for a given horse power the necessary boiler capacity can be more readily obtained than for simple locomotives.

Other questions which require special consideration for high speed locomotives are counterbalance and side-rods. By cutting down the weight of reciprocating parts to the lowest practicable limit, for the reasons already pointed out, the question of counterbalance may be made no more difficult than for locomotives for ordinary speeds. In passing, it may be noted that the radial component of the crank pin pressures near the half-stroke positions may be of importance in this connection as affecting the lifting tendency and "hammer blow" of the counterweight. The side-rods do not appear to present any practical difficulty, as they can be perfectly balanced, and as the additional stress in them due to the centrifugal action of their weight can be readily calculated and allowed for in their design.

To summarize these notes, it appears that a locomotive which shall be well fitted for much higher speeds than those now customary should have the lightest reciprocating parts consistent with safety, large driving wheels, short stroke, large boiler capacity, high boiler pressure, ample area of steam and exhaust passages, and compound cylinders of the tandem or equivalent type. With due consideration of these factors there does not appear to be any fundamental reason in the locomotive itself, why a speed of 100 miles per hour on suitable track cannot be reached and maintained.

The Evolution of American Rolling Mills.

BY R. W. HUNT, CHICAGO.

We present the following extracts from the address of President Hunt in opening the New York meeting of the Society of Mechanical Engineers.

As the production of railway bars or rails represents the largest volume of all the many manufactured forms of iron and steel, it is natural that we should first consider mills in which these are made. As most of you know, iron rails were rolled from a pile composed of a number of bars of wrought iron placed one upon the other, brought to a welding heat in a furnace, and then passed between the grooves of rolls, which welded them together, and gradually elongated and formed the mass into a finished rail. In the early days railway engineers were not only satisfied to accept these rails cut in much shorter lengths than now prevails, but, in fact, up to about 1859 would not receive them over 21 feet long. James M. Swank, in his "Iron in all Ages," states that the first rails 30 feet in length were rolled by the Cambria Iron Company in 1855, but there being no sale for them, the rails were placed in the mill yard tracks. He also says the first 30-foot rails rolled to fill an order were made by the Montour Company in January, 1859, for the Sunbury & Erie Railroad Company.

The first American rail mill—that is, one built to produce other than strap iron rails—was the Mount Savage Works, situated in Allegheny County, Maryland, erected in 1843. Rolling began in 1844.

After enumerating a number of the first rail mills put in operation Mr. Hunt continued:

Other mills were built or remodeled to roll rails until in 1850 there were some 15 rail mills in the country, but the commercial conditions were such that the spring of that year saw but two of them in operation.

I have named these early rail mills as matter of history. Some of them are now makers of steel rails in new plants, others are producers of other finished forms of iron and steel, while still others have gone out of existence. In some cases scarcely a vestige remains of a one time great establishment. The mines are abandoned, the blast furnaces have but a few stones to mark their sites, and the rolling mills are so completely wiped out that not a trace of them remains. The once populous village of busy workers is now monumented by crumbling ruins of their homes. But not so the industry. The United States to-day leads the world in her rail production.

After giving a history of the Cambria Iron Works and telling of difficulties the company fell into through the use of inferior ore, Mr. Hunt tells of how they were served by John Fritz inventing the Yielding Hanging Guides and Driven Feed Rollers. This solution, he continued, seems now such a simple one. But we must remember that at the time of its conception rolling mills were considered old institutions, and their designers and managers thought themselves, and were thought by others, to be very smart men. Moreover, there were difficulties in the construction and operation of this proposed mill which would appear only to those possessed of some practical knowledge. Indeed, some of those high in the councils of the Cambria Company entered solemn and official protests against that crazy man, Fritz, being permitted to waste the company's money. Its affairs were badly enough off, as it was, without adding this foolishness.

In addition some of Mr. Fritz's brother engineers and intimate friends compelled themselves, as a matter of fraternal duty, to labor with him against his folly, and thus prevent his scattering to the winds his most excellent and hard-earned reputation. In spite of all, he had the courage of his convictions, and the new mill was built. Let me tell of its start in his own words: "The three-high mill was started on Wednesday, July 29, 1857. We charged and heated six rail piles. We rolled three of them, making perfect rails, when the eccentric of the rail mill engine became hot, and bent the rod badly. Having tried the mill, and all gone perfectly, we stopped, resuming work on Friday morning, and continuing regularly until the usual quitting time on Saturday afternoon."

I doubt if ever during Mr. Fritz's subsequent eventful life he has had to carry quite as heavy a mental load. Since then mighty works have grown from his designs and under his charge. Millions of dollars have been invested on his judgment. The monster steam hammer of the world is his creation; but I venture that while waiting for the shock of its first 125-ton blow, his anxiety was but as that of a child compared to that felt while the first rail pile was passing between the rolls of his 1857 mill.

The Fritz mill was rapidly adopted by the rail mills of the country. Mr. Fritz protected himself by patents, which were soon acquired by a combination representing the larger rail mill organizations. The iron rail industry of America grew rapidly, but as the traffic, weight of equipment and speed of trains of the railroads increased, the demand for more enduring rails became imperative. This resulted after a long and busy period of experiments in the invention and adoption of Bessemer steel rails.

THE FIRST STEEL RAIL.

The first commercial rolling of steel rails was at the Cambria Works in August, 1867, on an order from the Pennsylvania Railroad Company, from steel made by the Pennsylvania Steel Company at their Steelton plant. These rails were rolled on a three-high 21-inch train, on which the heavier sections of iron rails had been rolled. At first the steel ingots were drawn into blooms under steam hammers. George Fritz concluded that this was not the proper manner of treating the material. He had blooming rolls prepared, and placed in one set of the 21-inch rail train housings. A. L. Holley was then in charge of the Pennsylvania Steel Works, and sustaining Mr. Fritz in his experiments, had ingots 8¼ inches square cast and sent to him. These were bloomed by the rolls to 6½ inches square; recharged in the heating furnaces; wash-heated, and then rolled into rails. This practice was successful, and I believe this was the first cogging, or blooming, mill.

THE FRITZ BLOOMING MILL.

On July 10, 1871, the Bessemer works of the Cambria Iron Company made their first blow, the steel from which was rolled in a blooming train designed and built by George Fritz. As I have previously recorded, he and Holley were close personal and professional friends, and their interchange of ideas and mutual assistance was frank and full. Fritz was an ardent admirer of Holley, but he could not simply copy any man; hence, while cheerfully giving Holley credit for everything taken from him, he introduced many new ideas in his arrangement of the Bessemer plant and blooming train. In the latter he made the middle roll stationary and moved the top and bottom ones, thus saving times in setting the passes; and as distinctively new and important features he arranged to drive the rollers in the tables by means of gears, controlled by friction clutches, deriving their power from the train engine. He also invented a hydraulic pusher, working between the rollers, for turning over and moving the ingots on the tables. These last two features constituted the Fritz blooming patent. By these improvements the mill force required was reduced to four men.

REVERSING MILLS.

In 1868 the Freedom Iron and Steel Company, with works near Lewistown, Pa., started operations in a plant of almost entirely imported English machinery. In fact the Bessemer blowing engine, which was built by I. P. Morris & Towne, of Philadelphia, was the only item of any importance of American construction. The company's original intention was the manufacture of Bessemer steel plates and tires. They put in a reversing plate mill, driven by a reversing Ramsbottom engine. This was soon changed to a rail mill, and was the first reversing rail mill in America. The works were not successful, continuing in operation but about one year.

In August, 1881, the Pittsburgh Bessemer Works, at Homestead, Pa., started. In their construction it was sought to keep clear of all patents controlled by the Bessemer Association. I presume this, together with their desire to produce billets and slabs of various sizes, led to the adoption of a two-high reversing blooming mill, designed and constructed by Mackintosh, Hemphill & Co., Limited, of Pittsburgh, Pa. This was the first complete mill of that type of American construction. But in 1879 Messrs. Shoenberger & Co., of Pittsburgh, had experimented with a reversing blooming mill, and, later, Andrew Kloman had put in such a mill for rolling eye bars at his Superior mills; experience gained from these guided the firm named in designing the Homestead Mill. These works are now part of Carnegie, Phipps & Co.'s Homestead plant. The South Chicago Bessemer plant and rail mill of the North Chicago Rolling Mill Company went into operation in June, 1882. This mill was designed by Henry C. Kriete (since deceased), the mechanical engineer of the company, and most of the machinery was built in their own shops. Mr. Kriete

adopted a Fritz blooming mill, but a reversing two-high rail mill, this being the first reversing rail mill built in the country.

COLD ROLLING.

I come now to speak of what may more appropriately be termed a process, because the accomplishment was reached without a special mill. Of course the metal of the rolls and the grooves in them had to be of a special character, but the work was done on an ordinary merchant bar mill. I refer to the cold rolling of iron. This was invented by Bernard Lauth in 1859. His patent was dated Aug. 23 of that year, and the process became a distinctly American one. Jones & Laughlins, of Pittsburgh, Pa., acquired the sole control in this country, and derived fame and fortune from it. While a great deal of cold rolled iron shafting and other articles is still used, the cheapening of steel has caused that metal to largely replace iron, and its greater stiffness has rendered unnecessary its being cold rolled for most purposes.

AMERICAN PLATE MILLS.

In 1864 Mr. Lauth patented another invention, and that was the three-high plate mill, with the diameter of the middle roll much smaller than the other two. Much of what I have said in favor of the three-high rail mill applies to this type of plate mill, and it soon became the American mill and was also largely adopted in other countries. Mr. Lauth has been a constant experimenter, and has made many rolling mill improvements of great originality and value. His name must always rank high among those who made successful the iron and steel industry of this country. American plate mills have developed in many points, as the greatest requirements of steel made more powerful trains a necessity.

The plant of the Otis Steel Company, of Cleveland, Ohio designed and built by our fellow-member, S. T. Wellman, in 1873-74, and started in 1875, afterward added to and improved by him, was for a long time the most complete one in the country. The increasing demand for steel plates, also for armor and other heavy plates, has led to the building of other large mills, notably by Park, Brother & Co., Shoenberger & Co., Linden Steel Company, Spang Steel & Iron Company, etc., of Pittsburg, and particularly Carnegie, Phipps & Co. of the same city. The latter works possess some powerful mills, which have been lately increased. The universal mill has been largely employed in America, but while the original designs have been added to, I think Wagner, of Austria, deserves credit as the original inventor. In 1853 Charles Hewitt, since deceased, designed and built for his firm, Cooper, Hewitt & Co., of Trenton, N. J., a beam mill on the universal principle which was a radical departure from all previous plans.

American and English Locomotives.

The discussion relative to the comparative efficiency of American and English locomotives which has been carried on between several American and English technical papers with more or less vigor for over a year, is at present being considerably enlivened by the *Railroad and Engineering Journal*. Commencing in the November issue, interesting tables are presented showing the locomotive mileage and expenditures of 40 American roads for the year 1890. This shows the performance of 14,863 locomotives for that year.

Comparison is made with the performance of 14,073 English locomotives operated on roads in England, Ireland and Scotland, for the half year ending June 30 and July 31, 1888. The following table deals only with the totals of Tables I. and II. given by our contemporary:

TABLE I.

	Average annual mileage of locomotives.	Coal consumed per engine mile.	Cost of repairs per engine mile.	Total cost of locomotive service per engine mile.
American..	35,650	74.37 lbs.	4.25 cts.	18.87 cts.
English.....	24,610	37.53 "	5.30 "	18.72 "

Of the discussion relative to the tables we abstract the following:

It seems hardly necessary to dwell upon the advantage which American locomotives possess over their Anglican contemporaries, in their greater capacity for doing what they are made for — that is, for running and pulling trains. If we were arguing about horses, it would be apparent that an animal which would travel on an average 35 miles per day was a much more serviceable and more valuable beast than one which would travel only 24 miles, even though the one which could travel farthest ate more oats than the other. The same thing is true of locomotives. Railroad companies buy, build and own them for the service they can perform. That is what gives them value. Our adversary, apparently, entertains—vaguely, perhaps—the idea that the "chief end" of a locomotive is to evaporate the largest quantity of water per pound of coal. A maximum evaporation of water is of some importance, but to a railroad company, crowded with traffic, and an insufficient equipment, the *service capacity* of their locomotives is paramount to everything else. Its influence on the interest account is a matter of simple calculation. Supposing a road, say in some new country, is equipped with 250 American locomotives. These, at $8,000 each, would cost $2,000,000. To do the same work, 375 English locomotives would be needed at a cost—assuming the same price—of $3,000,000. That means, of course, $1,000,000 more capital and an annual interest charge of $50,000, without any allowance for deterioration. It also means more engine house capacity, more men to take care of engines, more yard and shop room, and a very great addition of expense in the locomotive department.

The last number of "Poor's Railroad Manual" gives the total number of locomotives owned by the railroads of the United States at 32,241. If the annual mileage of American locomotives did not exceed that of their English contemporaries, 46,704 locomotives would be required to do the work which the 32,241 are now doing. That is, 14,463 *more* than are now owned would be required to do the work of our railroads. At $8,000 apiece, this additional equipment would cost $115,704,000.

The remark of *The Engineer* that "every attempt that has been made by writers on the subject to prove the superiority of the American locomotive has been so far a dead failure," has been already quoted. It says, "The facts are too strong." Now, we submit to our esteemed adversary and to our readers the question whether a $115,000,000 fact has not considerable "strength."

COAL CONSUMPTION.

The strong point which *The Engineer* has dwelt upon during the discussion of the relative merits of our locomotives and theirs has been the greater economy of their locomotives in the consumption of coal. From our tables it will be seen that the average consumption on British roads, for the half year covered by Table I., is 37.53 pounds per engine mile, whereas on the American roads the average is 74.37, or almost exactly twice as much as that of the British engines. If this consumption was of coal of the same quality, and in doing the same amount of work, and if the relative merits of locomotives depended entirely on the fuel consumption, it would, of course, be a bad showing for our engines.

We have no direct testimony bearing upon the relative value of English and American coals, but all the information received from persons who have had experience both here and in England is to the effect that the coal used there is much better than the average here, especially better than that used in the Western States. Of course [December paper] in any comparison of fuel consumption, account should be taken of the loads hauled. Unfortunately, only a few of our American railroad companies—and, so far as we know, none of the British lines—publish any statistics which show what their train loads are.

From statistics of 12 American roads a table is then presented showing the average number of cars per train, weight of train, and pounds of coal consumed per ton of train in both freight and passenger service.

Following are the totals:

TABLE II.

	Average number of cars per train.	Weight of train exclusive of eng. and tender.	Pounds of coal consumed per mile.	Pounds of coal consumed per ton of cars.
Passenger	4.81	130.3 tons.	66.97 lbs.	.515 lbs.
Freight	22.14	553.5 "	115.70 "	.215 "

Utilizing a tabular statement published in *The Engineer*, in its issue of Nov. 7 of last year, in which the performance of new goods engines were reported on the North British Railway between Glasgow and Carlisle in the winter of 1876-77, the article continues:

The trial was carried out by Mr. Drummond, then the locomotive superintendent of that line, in order to test the relative merits of the injector and the feed-pumps as boiler feeders. The fuel consumption is reduced to the quantity burned per mile per ton of train or cars. The average for the 16 trials was .272 lbs. per ton per mile. This, it will be observed, was during a trial, to which special attention is always attracted, and therefore better results are attained than in ordinary practice.

We are able, however, to compare this test on the North British road with a similar one on the New York Central road, which was made last year under the supervision of Mr. Buchanan, the superintendent of machinery of that line.

TABLE III.

	Distance run, miles.	Miles per hour.	Grades, feet per mile.	Weight of train, tons of 2,240 lbs.	Lbs. of coal consumed per mile.	Lbs. of coal consumed per ton of train.
North British.	3,000	20.4	6 and 52	223.3	59.33	.254
N. Y. Central.	2,700	15.8	34 and 42	1212.0	127.70	.105

The coal consumed by the American engine per mile run, is thus shown to be double that consumed by the Scotch engine. But when the coal consumption is compared as to amount used per ton of train the proportions are reversed, as the American engine consumed less than half that of the other.

REPAIRS.

As to the matter of repairs, Table I. shows that on the American roads included in that table the cost of repairs averaged 4.25 cts., and the same item on the British roads included averaged 5.30 cts. Continuing our contemporary says:

The difference appears the more remarkable when the fact that our engines haul much heavier trains is taken into consideration. More than a year ago our adversary took occasion to remark, that "it is very difficult to understand how, seeing that labor and materials are all more expensive on the other side of the Atlantic than here, the work of repair can be done for less money." We can't explain why our contemporary has difficulty in understanding the undoubted fact, which is shown by the figures in our table, but it is a fact, nevertheless, and it is due to the better designs of our engines, which have been made or evolved more with reference to facility of repair than English locomotive designs have been.

Sanitary Conditions of Cars.

An interesting report upon the subject was made by a special committee of the American Public Health Association, at the last meeting of that association, held at Kansas City.

The committee said in their report that the sanitary requirements of railway cars have rapidly increased within late years, and that when frequent changes of cars were required in making a long journey, maintaining the cleanliness of cars was a much easier matter than under the existing conditions to-day, which make the most important trains veritable traveling hotels in which passengers live from one to four days. The sanitary conditions necessary to health and comfort are the same here as in any other place of residence, while the difficulty of securing these valuable conditions increases with the length of time the car is in service. Hence the greater convenience of our through trains is accompanied by the greater difficulty, as well as the more urgent necessity, of keeping the cars in a wholesome condition.

The proper sanitary requirements of railway cars are: 1, perfect cleanliness; 2, fresh air at all times, free from dust, smoke and cinders; 3, during that portion of the year when artificial heat is required, heating apparatus that will, while the cars are suitably ventilated, maintain an equable temperature of 65 to 70 degrees Fahr. in all conditions of weather to which the car may be subjected.

As to cleanliness, the committee considers that the responsibility for the perfect cleanliness of cars, starting upon a journey, rests upon the railway authorities; and that, after the start, responsibility for keeping the cars clean during the journey becomes a divided one, and devolves quite as largely upon the occupants of the cars as upon those in charge of the train.

The frequent uncleanly condition of first-class passenger cars that have been but a few hours in service is familiar to all, and this condition is largely due to the want of that cleanly care on the part of passengers which they are accustomed to exercise in their homes. Very good people forget when traveling their duty to fellow passengers and are guilty of offenses which should meet with some rebuke. Throwing upon the floor fragments of lunches, the refuse of fruit, etc., or spitting upon the floor, are as great offenses in a railway car as in a first-class hotel. Yet in the latter case no one would think of committing these offenses, nor would they be permitted to do so were they so inclined.

At the same time, it is suggested, railway authorities should exercise the same watchfulness in keeping the car clean and the same authority to demand in this regard due diligence on the part of the passengers that the keeper of a first-class hotel is bound to use toward his guests.

When these mutual obligations between the passengers and the railways are lived up to, the cleanly conditions of passenger coaches will be greatly improved.

A Coal Saving Locomotive.

An enterprising California reporter of a local paper has become interested in compound locomotives, and in publishing an interview with the general superintendent of the Southern Pacific makes Mr. Fillmore say some odd things about the new ten-wheel Schenectady compound engines being used on that road between Sacramento and Oakland. "There is the latest invention," said Mr. Fillmore, tossing over a photograph of a coal-saving locomotive. "The new engine is built to use both high and low pressure consentaneously. The weight on the drivers is 99,800 pounds, on the truck 30,800 pounds, a total of a little over 65 tons. That weight is exceeded by many of the engines in use on the company's lines, but it is believed that by using the new device the lighter machines will do quite as much duty as the old ones, and at a saving of wear and tear both of roadway and engine.

"The new model appeals to the trained eyes of railrood men as being a workmanlike-looking construction, but the average man will miss the handsome outlines of the older models, with high, roomy cabs, quaintly devised sand tanks and gracefully swelling smoke-stacks.

"The run from San Francisco to Sacramento is 89 miles, and the old passenger engines in use burn 3½ tons of coal in making the round trip. The new machine burns but 2½ tons of coal in covering the distance in the same time.

"To estimate the value of the saving a few figures may be helpful. The ordinary life of a locomotive engine is twelve years, and its cost from $10,000 to $12,000. The saving in coal under the new system, in twelve years, would amount to $12,960, an amount more than sufficient to replace the worn out locomotive with a new one."

Western Railway Club.

Instead of holding a regular meeting on Dec. 15, the Western Railway Club visited the World's Fair grounds in a body, having accepted the invitation of Mr. Willard A. Smith, chief of the burèau of transportation exhibits of the World's Columbian Exposition, to inspect the grounds and work of construction which is progress at the present time.

The next meeting of the club will be held on Tuesdayi Jan. 18, at 2 P. M., in the club rooms, 850-54 Rookery Building, Chicago, at which meeting Mr. Peck's paper on "M. C. B. Standards and Defect Cards" (read at the November meeting) will be discussed, and Mr. D. L. Barnes will read a paper on "Recent Improvements in American Railroad Rolling Stock."

Communications.

Why Staybolts Break.

Editor National Car and Locomotive Builder:

In the October issue of your excellent Journal I saw an article on "Why staybolts break," by J. T. Connelly, who, after giving an expatiation on Mr. John Hickey's paper on the construction and management of boilers, proceeds to give some opinions of his own. He says that if staybolts be put in properly in size and tightness, he feels assured that there would be little, if any, trouble from broken bolts. Now what does this gentleman (who has much experience in locomotive service) mean? Does he really imagine that any one connected with boiler building or repairing will put in staybolts with, so to say, their finger and thumb? And as for size, I fancy any M. M. of the present age, knows exactly what strength a staybolt must have to stand the stress which it will, eventually in ordinary cases, be called upon to bear, and leave a pretty good margin besides. Mr. J. T. C. makes reference to my article on the breaking of staybolts where I affirm that the carelessness of engineers in applying the powerful brakes at their command causing the water to be drawn to the front end of the engine, and, on suddenly stopping, the water recoil strikes the unprotected parts of the firebox and thereby breaks the nearest stays, etc., etc. Now, with a great flourish this gentleman makes it out that this is quite a mistake, and that the sudden changing of a static to a dynamic force is a condition quite impossible, and in a sweeping manner says: Re-action the danger. "No," says he. "*The right way, if practiced, will certainly meet the difficulty.*" Hear, hear. May I ask has Mr. J. T. C. ever been on the footplate of a locomotive engine when such a thing as a danger signal is suddenly shown to the driver of an express train, running at high speed on a dark night? If so, and he has seen what there takes place, he will understand what I mean. If not, it would be wisdom on his part not to say anything about things being impossible. The many and terrible boiler explosions of practically new engines, point with fearful vividness to something radically wrong either in the construction or management (perhaps both), and my firm belief is that the latter is responsible for the greatest part, distinctly pointed out in my article on staybolts. Very respectfully yours,

G. BAILEY,
States Railway, Denmark.

Safety of Chilled Car Wheels.

Editor National Car and Locomotive Builder:

The communications from "M. C. B." and F. W. Coolbaugh in your December issue can be answered together as both practically take the same ground.

Herewith find the original statement of breakage of steel tires on German railroads in the years 1884 to 1889 inclusive. This please note, compare with the translation and return. If you have space kindly insert the statement with this communication. Its authenticity may be vouched for by the fact that it is from the hands of the President of German State Railroads, and its correctness can hardly be questioned.

Both "M. C. B." and Mr. C. argue from the same standpoint on the demerits of the chilled wheel; i. e., that their reputation as an article of general manufacture is bad, and, therefore, they must all be considered in the same light. Will these gentlemen accept a similar verdict for steel wheels because of the breakage of 20,608 tires out of an average total of one million used yearly for five years? I hardly think so. They would probably want to base their conclusions on some certain make of wheel, and not to assume responsibility for all of the failures of every kind. Mr. Coolbaugh also states that Bessemer metal is used in Europe, and not open hearth. About one-third of the tires in this statement were Bessemer metal.

I have fairly complete records of the breakage of all kinds of car wheels, but fail to find one on "an eastern road two years ago" that caused the death of 30 people, wounded 50 and cost $400,000 in damages. While on this subject let me direct Mr. C.'s attention to the accident caused by the breaking of a steel tire on the Grand Trunk Railway at St. George, Ont., Feb. 27, 1889, where nine people were killed and many injured, and for which damages against the road for over one million of dollars have been awarded by the courts. This is in addition to the value of property destroyed. In this instance, at least, the flaw did not "take months to develop."

There is much in Mr. C.'s remarks of what he terms "intensely personal" to the subject of cast wheels, and it would be idle to dwell on such points. As he truly remarks, "one fact upsets a dozen theories."

"M. C. B." states that I "am directly interested in trying to keep up the reputation of chilled wheels," and therefore it follows that my arguments must necessarily be made to bolster up a bad cause. But nothing of the kind is the case. We will make any kind of wheel there is a demand for, in proportion to the demand. According to Poor's Manual there are over 1,000,000 freight cars in the United States, with 8,000,000 chilled wheels under them. There are 60,000 locomotives, passenger, baggage and express cars. If every one of these was equipped with steel wheels there would not be a total of 500,000 in service, or one-sixteenth of the total number of chilled wheels in use. As probably half of these have chilled wheels under them, it is likely that not over one-twenty-fifth of the railroad equipment of this country is fitted with steel wheels.

We are quite well equipped for making steel wheels. We have our foundries, machine shops, etc., and could undertake the business on very short notice. As the pioneer makers of steel wheels in America (the Allen Company) use a cast iron center for their safest type of wheel, and as the steel wheel makers buy all their tires, it follows that we can make steel wheels quite as well as anybody if we want to. We make chilled wheels, however, because an experience of many years has failed to show us where that type of wheel is in any way defective for any service for any reason that is not due to causes that can be entirely remedied, not by theory and talk, but by careful and experienced practice in the foundry and machine shop.

This opinion is based on "facts" that have cost us many years of hard work, and a great deal of money to demonstrate. The facts are that we have a perfect record of over 600,000 wheels of our make, as stated in my November letter, used in the last seven years in service as severe as steel wheels were ever subjected to, without one case of breakage, a greater number than the total of steel wheels in use in the United States. Of these over 200,000 are "machined" wheels; that is, they were turned absolutely true and balanced before going into use. We are turning out daily four hundred of such wheels.

In conclusion I must take exception to M. C. B.'s remarks on the Pennsylvania Railroad management. No railroad in America has done more to advance the comfort and convenience of the public in every way and to improve every feature of railroad practice than the Pennsylvania Railroad. Hardly a road can be found anywhere that has not among its leading men those who have "learned their 'trade'" with that great company. It has been a training school for American railroads. While it may not be possible in every way to suit the ideas of all people, it is not fair to say of that company that it is narrow or prejudiced. It is managed by the men who made it, broadly and well, and is doing work of incalculable value in all that is progressive in its line.

It would give me pleasure to answer fully and specifically every question asked in the letters referred to, but it would trespass on your space and might not interest your readers who are not concerned in this matter.

P. H. GRIFFIN,
President New York Car Wheel Works,
BUFFALO, N. Y., Dec. 19, 1891.

STATEMENT OF STEEL TIRES BROKEN ON RAILROADS OF GERMAN EMPIRE IN YEARS 1884 TO 1889, INCLUSIVE.

Years.	Cast Steel. On hand and in use.	Cast Steel. Brok'n. No.	Cast Steel. Brok'n. Per Cent.	Fusion Steel. On hand and in use.	Fusion Steel. Brok'n. No.	Fusion Steel. Brok'n. Per Cent.	Martin Steel. On hand and in use.	Martin Steel. Brok'n. No.	Martin Steel. Brok'n. Per Cent.	Manganese Steel. On hand and in use.	Manganese Steel. Brok'n. No.	Manganese Steel. Brok'n. Per Cent.	Bessemer Steel. On hand and in use.	Bessemer Steel. Broken. No.	Bessemer Steel. Broken. Per Cent.	Other Steel. On hand and in use.	Other Steel. Broken. No.	Other Steel. Broken. Per Cent.	Puddle Steel. On hand and in use.	Puddle Steel. Broken. No.	Puddle Steel. Broken. Per Cent.	Number of Steel Tires on hand and in use.	Number Broken.	Per Cent.
1884.....	106,838	259	0.24	197,573	298	0.15	53,922	52	0.10	1,835	.....	.....	380,189	834	0.22	6	.....	.....	201,582	1,410	0.70	941,945	2,853	0.30
1885.....	94,365	370	0.39	221,212	464	0.21	66,848	107	0.16	1,464	6	0.41	402,140	1,208	0.30	302	16	5.30	173,351	1,378	0.79	959,682	3,549	0.37
1886.....	96,099	294	0.31	189,688	500	0.26	93,694	177	0.19	2,039	.....	.....	453,857	1,771	0.39	244	32	13.0	157,015	1,214	0.77	992,636	3,988	0.40
1887.....	99,768	267	0.27	129,232	304	0.24	171,370	169	0.10	1,767	17	0.96	471,030	1,399	0.30	214	28	18.08	134,615	780	0.58	1,007,986	2,964	0.29
1888.....	92,203	348	0.38	115,617	380	0.33	204,932	241	0.12	1,419	18	1.20	510,925	1,998	0.39	170	68	40.0	115,887	821	0.71	1,041,135	3,874	0.37
1889.....	64,359	174	0.27	140,635	311	0.22	284,815	241	0.08	1,251	.....	.....	510,985	1,909	0.37	440	65	14.08	100,456	680	0.68	1,102,941	3,380	0.31

Editor National Car and Locomotive Builder:

Compound locomotives of the two or four cylinder types are supposed, theoretically at least, to do the same amount of work on each "side," and with this end in view (referring now to a two-cylinder compound) the length of the link hangers are frequently different, with, often, special forms of tumbling shafts, difference in outside lap, etc., all planned to cause an equality of work in each cylinder. Now, it is manifest in a two-cylinder compound, in which the areas of the cylinders are approximately in the ratio of two to one, that if an equality of work is done in each cylinder, that the mean effective pressure per square inch in the low pressure cylinder must be one-half that in the high pressure, inasmuch as the low pressure cylinder has twice the area of the high pressure. But is this the case? The writer has indicated several two-cylinder compound locomotives, and in no case has it been even approximately the case.

I notice in your November issue of 1890 a lot of cards from some compounds on the E. T. V. & G. R. R., with a table worked out giving the data of the cards. From this table you will observe the same want of equality is found in the mean effective pressure as the writer found in his private work.

Take, for instance, cards 14 and 14*a*, in which 14 is from the high pressure cylinder and 14*a* from the low pressure cylinder, both taken simultaneously at 186 revolutions per minute. We find the mean effective pressure per square inch of the high pressure cylinder to be 40 lbs. and 42½ lbs. for the front and back stroke respectively, and 40 lbs. for the low pressure on both strokes, the reverse lever being in the 12⅛-inch notch. Take cards 15 and 15*a* at 210 revolutions per minute and we have even a higher mean effective in one end of the low pressure than in the high pressure. In fact all the cards show the low pressure mean effective pressure very close to the high pressure cylinder, so that it is clear the low pressure side was doing twice or nearly twice the work of the high pressure side. With one side of the engine doing twice the work of the other the result would be (as it is in fact) similar to a simple engine running on "one side." This effect is very noticeable at starting and at slow speeds.

The writer would like to hear your opinion and ideas on this subject.

COMPOUND.

Feed-Water Impuri ies.

Editor National Car and Locomotive Builder:

Noting your remarks on "Remedy for Feed Water Impurities." There is no question but that "intelligence and care are of the first importance" in the use of processess and devices for the purification of water. Both have been used by the writer in an experience extending a number of years, with failure as a result in every instance. On a certain road there are three water stations within a distance of 40 miles. A qualitative analysis of the water, from one station, gives 7 grains of solid matter to a gallon, another 44 grains, and the third at times is salt water which deposites one-sixteenth of an inch pure salt in the boilers in five days' work. In the next one hundred miles there are eight water stations, showing as many different analyses of water, each of which would "crave" a different compound. Would it be practicable to carry on the engine or tender an "assortment" of compounds for the treatment of these different waters?

In some cases, before a fresh supply of water is put in the tender, all that in would have to be drawn off, or the the fresh water, mixed with that already in the tender, would make a compound that could not he kept in the boiler. On a road with heavy traffic this changing of water would take up too much time and would not be permitted. On a line where the analysis shows the water to be of precisely the same quality a compound might help. Even then it would be difficult, as rain would change the percentage of impurity, affecting the operation of the compound to a certain extent. Chemical compounds hold impurities in solution, which must be removed from the boiler by blowing off or washing out. By either process, as the level of water is reduced in boiler, the heat in the boiler will cause the impurities held in solution to adhere to the metal, forming scale. If the boiler be permitted to stand until cool the same process takes place, but not to so great an extent. The construction of locomotive boilers prevents them from being washed out thoroughly and the sediment removed.

By examining a piece of scale with a magnifying glass, we will find it composed of strata. Counting the layers will enable us to determine the number of times water has been changed in the boiler from which the scale has been taken. In using some of the compounds it is claimed that it is essential to change the water or wash the boiler every six hundred or one thousand miles. This means that the fire is to be drawn and the boiler permitted to cool; resulting in the loss of from five to ten hours' engine service. As three hundred miles in twenty-four hours is a common mileage for locomotives to make, on a road with one hundred and fifty to two hundred locomotives, this loss of service would be a serious matter, and would cost the company more in a year than the expense caused by bad water.

Mechanical purifiers (apparently) work well at first, because the device is new and free from scale; but in a very short time the process of sedimentary deposit, as described above, fills and renders them useless. The cost of taking out, cleaning and replacing, soon makes the expense equivalent to that of taking out flues and cleaning boilers. When this point is reached the "device" is abandoned. Very few persons fully realize the enormous quantity of water evaporated by locomotive boilers, or the vast amount of impurity deposited from water holding as low as 20 grains of solid matter to the gallon. At one time the filtering of water was seriously considered by a certain railroad company and elaborate plans prepared. All were surprised at the extent of the plant necessary to filter sufficient water. The cost would have equipped all their locomotives with new boilers. It is needless to say that the "filtering scheme" was promptly abandoned.

* *

The largest lathe in the world is now being built at Washington by Wm. Sellers & Co., of Philadelphia, for the naval gun shops. The lathe will weigh 500,000 pounds, and will be 133 feet in length. Its boring capacity will be 16 inches.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

UNIFORMITY IN CAR CONSTRUCTION.

A call has been made from two sections of the country, widely separated, for a standard box-car. Mr. Peck, at the Western Railway Club, said he believed the whole car should be standard, and every piece of it should be like that of the other cars of the same capacity.

Mr. Marden, at the New England Railroad Club, said in substance that economy in rolling stock repairs depended greatly upon uniformity in construction, and that he favored the adoption of a standard freight car.

The agitation for uniformity in the construction of freight cars is gaining headway every day, and in its widening circle is embracing "all sorts and conditions of men," from switchmen to the head of the nation. For reasons of humanity we must have uniformity in couplers; and for reasons of economy and celerity in repairs uniformity in all the details of construction is desirable. Public opinion and legislation are threatening to force the former, and it is probable that the increasing need for freight cars to make the greatest possible mileage, and the requirements of economy will eventually bring about the latter. Nor is there much doubt but that the movements toward this uniformity will be along the lines of the Master Car Builders' standards. How much easier, therefore, will the transition be for those roads that have from time to time adopted those standards and closely adhered to the same. And this should be a strong inducement to such roads as have been dilatory in this matter to consider well if it will not be worth while to, as soon as possible, catch up with the procession.

CARE OF BOILERS.

The paper read by Mr. C. A. Seley at the last meeting of the Northwest Railway Club, on the inspection and care of locomotive boilers, a liberal abstract of which appears elsewhere in this paper, will doubtless prove interesting reading to all interested in the maintenance of locomotive boilers.

Mr. Seley's closing remarks, made as he said to provoke discussion, are particularly interestiug, and are upon a subject too little discussed, and are therefore deserving of special consideration. He said in substance that he believed the cause of the great trouble experienced in having cracked side sheets, and other expensive and annoying boiler leaks, was due in a great measure to the abuse locomotives are commonly subjected to in being housed at the end of trips.

This abuse consists, as Mr. Seley explained, in the rapid fall of steam pressure and temperature due to cleaning out all the fire from the fire-box, and the often wide open dampers, or the generally ill closing dampers, permitting a great rush of air to pass through the fire-box and tubes, rapidly chilling the boiler and fire-box, and particularly its lower portion.

What was said is absolutely correct, and we have no doubt but that the abuse referred to causes much of the trouble complained of. But the case, as stated, is really confined within too narrow limits. It is not only at round-houses that this abuse occurs, but on the road as well, while the locomotives are in charge of their crews. True, the fire is seldom all raked out on the road and the boiler subjected to the chilling effects of heavy drafts of cold air as in the round-house, but the sudden *changes of temperature* occur on the road as in the house, and it is this that does the mischief. When changes of pressure occur it is a matter of small consequence whether the grates are bare or whether they support an intensely hot fire. If the heat of the fire is not competent to maintain the steam pressure, and the pressure and accompanying temperature falls—the mischief is done irrespective of the quantity or the heat of the fire.

Broadly, then, we should say that the annoyance of leaks in locomotive boilers, the expense of same and of the necessary repairs, is due in a large measure to the often rapid changes of pressure and temperature they are subjected to in service and in housing. The changes of steam pressure, while in service, may be due to any of a variety of causes, as, for instance, bad coal, a poor steaming engine, carelessness on the part of the fireman in the preparation or management of the fire, and, often, carelessness on the part of the engineer in an injudicious use of the injector.

As illustrating the effects of bad coal on boiler repairs we recall a recent experience of the Burlington & Missouri River Railway. Some new mines were opened on the line of the road, from the output of which all the engines on the Wyoming division were supplied with fuel. The coal of the mines was of an excellent quality, but was so badly interspersed with rock, "splint" and "bone" that great trouble was experienced from the fire-box filling up with the rock and slow-burning "bone." An engineer explained the situation tersely by sending in two samples of the coal marked respectively· "Newcastle peacock coal, 180 pounds of steam and no grief," and "Newcastle bone coal, 180 pounds of grief and no steam."

Now the result of using this coal was that it was a constant struggle to get over the road, and the steam pressure fluctuated badly. Often in running 20 miles the pressure would fall from 160 pounds to 80 pounds, and then, having to stop to blow up, would be forced to 160 pounds as soon as possible. Immediately this condition of affairs obtained there came great trouble from broken staybolts and leaking boilers.

By proper inspection the trouble with the coal was remedied, and the engines supplied with fuel with which steam could be kept up; and then the trouble with the boilers ceased. Of course a poor steaming engine stands a good show for the same kind of treatment, and consequent trouble. Happily, with the larger boilers now coming into general use, poor steaming engines are getting scarce.

Fluctuating pressure due to mismanagement by the engineer or fireman is common. It is no unusual thing for the pressure to be allowed to vary from 150 pounds to 130 pounds and even to 110 pounds when approaching a station, or the top of a descending grade. In a variation of pressure from 150 pounds to 130 pounds there is a variation of temperature of about 11 degrees Fahr., and in a variation of pressure from 150 pounds to 110 pounds there is a variation of temperature of 28 degrees. A steam boiler whose temperature rapidly fluctuates many times per day, from 10 to 30 degrees, undergoes strains that eventually can but result in damage and annoying leaks.

To save boilers from such treatment on the road and at the terminus of trips, engineers, firemen and hostlers should be informed in regard to the difference of temperature that accompanies difference of pressure of steam, and the evil effects of varying temperature upon the boiler. The question of any relation between the temperature and pressure of steam, or any relation between the temperature of boiling water and the pressure above it, is one with which the men, generally speaking, who handle the locomotives on the road and about the roundhouse are little acquainted with. Many have no idea that any such relation exists, and regard a change of pressure in the boiler much as they would regard a change of pressure in the main air reservoir—simply as it might effect the required work. A better understanding about this matter by all engaged in handling locomotives, and a judicious oversight by officers to prevent carelessness will surely bring about better results.

COMPOUND LOCOMOTIVES.

A correspondent in another column states that his experience has frequently been that the low pressure cylinder of the two-cylinder type of compound locomotives does double the amount of work done by the high pressure cylinder, and cites some instances of cards taken where the mean effective pressure was nearly as great in the low pressure cylinder as in the high pressure cylinder, and of course with double the piston area this would cause wide irregularity in the development of power for the respective sides of the engine.

Prof. Arthur T. Woods. in his article appearing in this issue, also gives an instance where 70 per cent. of the total work was being done in the low pressure cylinder of an American two-cylinder compound locomotive at about 250 revolutions per minute

It would seem, however, that if this difference existed to any great extent it would become manifest in other ways. Locomotives running with one side disabled, and with the other one doing all the work, generally show signs of the unusual service, if it has been either long or severe, by the difficulty of keeping everything tight and in order on that side of the engine doing the work.

Everywhere the harder the conditions of service are, in which locomotives are engaged, the greater is the expense and trouble of maintaining repairs.

In the NATIONAL CAR AND LOCOMOTIVE BUILDER for May, 1891, page 74, the following appears: "No. 284, the first compound built by the Schenectady Locomotive Works, has now been at work seventeen months, and doing remarkably hard running all the time. She runs between four and five thousand miles a month. There is no indication yet that she will be harder on repairs of machinery than the other ten-wheel engines doing similar work." As is well known this refers to a two-cylinder compound. We believe this could not truthfully have been said if there had been any very wide difference of work done by the high and low pressure cylinders respectively.

We have heard no complaint from engineers that they have experienced any increased difficulty in "keeping up" compound engines of the two-cylinder type over what was customary with simple engines. In the recent tests of the Rhode Island two-cylinder compound it is reported that: "The verdict of all the engineers is that it is an unusually cool running locomotive, light on oil and easy to take care of; the latter in their estimation being quite a point in the compound's favor."

While it may be easy to pick up some cases which may appear to support the belief that two-cylinder compound locomotives suffer from an unequal development of po er in the high and low pressure cylinders, it will require much more evidence than has yet been presented to cause those who may favor that type of engine to believe that it prevails, generally, to any very great extent.

It is interesting, however, that the point has been brought up, and we invite correspondence upon it.

TOOLS FOR RAILROAD SHOPS.

The paper read upon this subject at the last meeting of the New England Railroad Club by Mr. E. E. Davis, and the interesting discussion of the matter on broader lines which followed by the members present, is worthy of careful perusal by all interested in the efficiency of railroad shops and economical maintenance of rolling stock.

Mr. Davis is in charge of one of the best managed and most orderly railroad shops in the country; therefore his remarks upon this subject, which has evidently been a special study with him, are entitled to careful consideration. The tool-room organization that he advocates he has brought to a high state of efficiency in his own shop, and so is well able to speak of its necessities and advantages.

The paper and the discussion upon it covers the case so well that there is little more to be said. As stated, the economy resulting from the employment of the very best tools is not confined to the output of work in the shortest time, and the decreased labor of attendance, although this constitutes the greatest saving, but because, generally, of improvements in the design of modern machinery calculated to obviate as much as possible the absorbing of power in the machine itself, a larger proportion of the power furnished by the engine is expended in the performance of useful work—grinding the corn, so to speak—and less in simply running the machine. This saves coal, and, eventually, engine and boiler repairs. And even here the economy does not stop, but in the more accurately finished product of improved tools, as pointed out by Mr. Lander in boiler work, we get a better fit and a more enduring job, thus lengthening the time between necessary repairs and lessening the liability to annoying and expensive accidents. As a rule, general managers are keen enough to recognize the economy of an improvement in the efficiency of locomotives that will enable the traffic of the road to be moved at a cheaper rate, and are not slow in availing themselves of the advantage. The cost of repairs of rolling stock enters very largely into the total cost of moving traffic, and it is certainly as desirable to reduce this cost when practicable as any other item of expenditure. Surely the best way to do this is by the employment of the most durable material and the most efficient tools in doing the work of repairs.

The advantage of special tools to facilitate particular lines of work is, as illustrated by the gratifying results obtained with the pneumatic hoist, so evident that comment is unnecessary.

Altogether the subject is one of very great importance and worthy of more attention than is usually given it.

The extracts from the address of President Hunt at the New York meeting of the Society of Mechanical Engineers, entitled "The Evolution of American Rolling Mills," given in this issue, was crowded out of our December issue by matter that was considered of more present interest but of less permanent value. It is the most complete summary of what has been done in rolling mill practice up to he present time that has yet appeared.

INJECTORS VERSUS PUMPS.

At the last annual meeting of the New York Railroad Club Mr. F. A. Stinard read a paper upon "How to Prevent Leaky Flues," in which he said: "A reprehensible practice, and one that should be curtailed as much as possible, is running with the furnace door open and allowing cold air to pass through the flues, which, accelerated by the action of the exhaust, will very soon cause them to leak. The furnace door was not made or ever intended to be used as a damper. Engineers should avoid as much as possible pumping water into the boiler when not using steam; in fact, they should guard against anything that would have a tendency to cool off the flues suddenly, thereby causing a sudden contraction of the metal while under pressure, which, if repeated a few times, will very soon loosen them in the flue sheet and the result is trouble and expense. The engineer should see that the flues do not get stopped up with ashes and dirt; when 40 or 50 flues get choked up, the process of boring them out is liable to start them leaking. When flues are in this condition the fireman has to work a great deal harder to keep up steam, and the harder he has to work the more fuel he wastes."

These are good rules tersely stated, and if their meaning and importance could be impressed upon enginemen it would be well for the flues.

We must take issue with Mr. Stinard, however, on one point, and that is about putting water into the boiler when not using steam—when the engine is running or standing shut off. Instead of saying that engineers should avoid putting water into the boiler at such times, we should confine ourselves to cautioning them against allowing variations of pressure and temperature of the boiler; and for the sake of economy, for the sake of maintaining as nearly as possible a regular rate of combustion, and for the sake even of avoiding fluctuating temperatures, we should encourage the continuance of the injection of feed water while running shut off, and its discontinuance, when practicable, during hard tasks of work. With locomotives equipped with pumps, as of old, that fed cold water to the boiler, pumping with steam shut off, and without using the blower, was certainly very bad practice, and productive of much mischief to the flues and the whole boiler. With such pumping there was very little circulation of the water pumped in, as, being about 300 degrees colder than the water in the boiler, it sank rapidly to the bottom when entering, and stayed there until the throttle was opened to give steam to the cylinders. Circulation being prevented by the great differences in temperature and weight of the old hot boiler-water and the new cold feed-water, the hot water simply rested on top and in contact with the steam, thus preventing the chilling influence of the feed-water being felt by the steam or made manifiest on the steam guage. The cold feed-water could not impart its cold to the hot water above it, or mix with it except very slowly, and neither could the hot boiler-water impart its heat downward to the colder water below, or mix with it except very slowly.

This state of affairs allowed a large quantity of water to be pumped into a boiler, while the engine was running shut off, without affecting the steam pressure as indicated by the gauge, even although the fire might be at a very low heat. But immediately steam began to be used, either for the cylinders or for the blower, circulation was established inside the boiler, the quantity of steam resting upon the hot boiler water was rapidly used up, and the pressure as rapidly fell, so that by the time the old boiler-water and the new feed-water were thoroughly mixed up a great fall of pressure and temperature had taken place. We have frequently known of the pressure varying from this cause 60 pounds within two minutes. Of course it was wretched management, but only too common.

With injectors the case is altogether different. The feed-water on entering the boiler instead of being in the neighborhood of 300 degrees colder than the boiler water, as with the pump, is only about 100 degrees colder (we have records of an injector's delivery being 278 degrees, boiler pressure 140 pounds), and as the injector is drawing steam from the boiler constantly while working, an almost perfect circulation of the water in the boiler is kept up. Any change of temperature of the contents within the boiler is immediately made manifest on the steam gauge.

Therefore we are safe in cautioning enginemen simply against allowing changes of pressure, and leave them—encourge them in fact—to continue the injection while running shut off, when by so doing they can prevent waste of steam by popping, and at the same time store in the boiler a quantity of heated water that will allow, further on, of the injection being suspended during some hard task of work, resulting in less work for the firemaen and less coal consumption for the engine.

CHICAGO SMOKE.

There are a great many ways of viewing the smoke problem as it exists in Chicago, but there is no doubt that much improvement could be made in the appearance of the city and the comfort of its citizens by simply insisting that proper precautions against the formation of smoke shall be taken by all persons running steam plants. Such actions need not be burdensome. They should be in the line of conforming to the laws of combustion by the use of the simplest devices, and if properly done this would not involve great expenditure. But notwithstanding remedies at hand are simple, cheap and easy of application, the fact is that it is practically impossible to compel any parties owning steam plants to suppress the volumes of smoke which issue from their chimneys. We know of a number of cases where business men and others have complained time and again of the smoke emitted from certain chimneys close to their office windows, and the city administration has paid no more attention to such complaints than if they had never been made. This condition of affairs illustrates very forcibly the difficulties which are met in large cities when an attempt is made through the city administration to enforce proceedings against large manufacturing establishments, even though public opinion is strongly in favor of such a move. The fact is that the sanitary and other problems which are constantly arising and confronting the governments of great cities are such as ought to be dealt with by engineers and specialists, and should never be left in the control of boodlers and politicians.

We take the above without the caption from the *Railway Review*. Chicago's crying need is purer water to drink and purer air to breathe. The way the air in that city is loaded with the products of wretchedly imperfect combustion of bituminous coal is shameful indeed. Any one attempting to wear an article of dress there of a lighter color than soot, will not go far until he finds that it is fast changing to that somber hue.

It is something unusual to meet a man in Chicago without his face and hands are well powdered or streaked with diamond dust, or unless he has quite a valuable collection of it in the corners of his eyes.

Wake up, Chicago! This won't do for the fair.

EXTRAVAGANT FUEL CONSUMPTION.

The article appearing on another page under the above caption is interesting, in view of the fact that the extravagance alluded to occurred through the mismanagement of one of the oldest and most experienced locomotive engineers in America. It has often been said that while inexperienced engineers, or those of poor judgment, or generally careless about their work, might also be careless of the fuel consumption of their engines, yet it was unreasonable to suppose that an experienced and successful one—whose success could only be the result of care and good judgment in handling the engines and trains in his charge—would be careless about fuel. Our experience has been that some of the very best men to keep their engines in order and handle their trains successfully were extravagantly careless of the fuel consumption of their engines, apparently regarding the matter as of too little importance to merit their consideration. And as to experience correcting this fault, some of the oldest engineers we have known—many beside Hank Blank—were also the most careless, and most strongly opposed to practicing economical methods. There is no doubt about the ability of Hank Blank as a careful and successful engineer; but, simply, he had not yet realized that the matter of fuel economy cut any particular figure in operating a locomotive. He is a fair representative of a class of engineers, numbering thousands, distributed over American railways, who, while doing their work to the satisfaction of the train department, and maintaining their engines to the satisfaction of the mechanical department, are either too ignorant to know or too careless to practice the simple methods of economical management that would effect a considerable saving in the case of each individual engine, and, aggregately, a large economy on any railroad.

Mr. Seley's suggestion at the Northwest Railroad Club to put a cover over the tops of locomotive smokestacks while the engines are housed without any fire on the grates, to prevent circulation of cold air through the fireboxes and flues, receives some emphasis from the recent experience of a master mechanic who took charge of a new road where there had been much trouble caused by leaking boilers, which was attributed to the effects of bad feed water. For some time he worried along, unable to noticeably check the tendency of flues, stay bolts and mud rings to leak and give no end of trouble on the road and expense for repairs in the house. He noticed finally that it was customary for the round house men to lower the movable jacks with which the roundhouses were equipped to the tops of the stacks of engines when they came into the house, in order, it was said, that everything would be ready to fire up when the time came.

He forbade the practice, and the consequence was that he soon had his boilers giving but very little trouble.

The communication in another page from Mr. George L. Fowler on "the Strength of Truck Bolsters" directs attention to a subject which has been badly neglected. The same subject was touched on in our colums over a year ago by the mechanical engineer of the Atchison, Topeka & Santa Fe, but as a rule master car builders and others responsible for the designing of cars fail to make the bolster of strength proportionate to the other parts of the car. The letter from Mr. Fowler shows a curious diversity of strength in the bolsters used in cars on different roads and the calculations, no doubt, account for the cars belonging to certain roads being noted for bolster failures.

CALIFORNIA FUEL.

A great drawback to railroad and manufacturing interests on the Pacific coast has been the excessive cost of fuel. In 1890 the average cost of coal on the Southern Pacific was $5.25 per ton. Most of the coal used on the Pacific system of that road is shipped from Australia, and even some comes from England and Scotland in ballast. It is now reported that immense deposits of coal have been discovered in Alaska, located in the northwestern portion of Niga Island, the principle one in the Shumagin group, and about 900 miles west of Sitka, and that arrangements are being made to place this coal in a large way on the San Francisco market. It is said the coal is easily and cheaply mined, is virtually inexhaustible in extent, and can be delivered in cargo lots at San Francisco at $4 per ton.

It has been said that this discovery will be the means of revolutionizing the fuel supply for railroads on the Pacific coast. But as analysis of the coal shows it to be of lignitic formation, with a large percentage of moisture, it is hardly probable that it will make any change of a startling nature.

Certainly, some change that will bring about cheaper fuel on the western coast is earnestly desired by all well wishers of that otherwise happily situated and bountifully supplied country.

A correspondent in our last issue, in commenting on the paper read by Mr. W. G. Wattson before the Railway Superintendents Association, said that in the matter of making up time cards railway officers often placed themselves at a disadvantage by improperly dividing up the time of trains. While the time given a train may be sufficient for the entire distance it is to run, yet the local division of time, between stations, may be such that the card time cannot be made over the whole run. He suggests that consultation with trainmen, and especially engineers, would help to regulate this irregularity.

The intelligent locomotive engineer familiar with a division of road certainly knows more about how trains handle between different points on the road than any one else connected with the operating department. We use the word "intelligent" advisedly. Such an engineer could, if consulted as to proposed changes of time of trains in the class of service in which he belongs, give very valuable advice upon the formation of a schedule of running time that could be made most regularly and with the greatest economy.

The Supreme Court of Missouri has decided in the case of Thomas vs. Missouri Pacific that it is the constitutional and legal duty of all the railroads to receive and transport each other's passengers, tonnage and cars. Unbroken cars must be accepted, no matter what the variation in coupling arrangements. This is believed to be the first decision in which such action by railroads has been considered mandatory upon them.

The New York Railroad Club.

At the annual meeting of this club, held in New York City Nov. 19, the following officers were elected: President, R. C. Blackall, superintendent motive power and mach. Delaware & Hudson Canal Co.; vice-president, Geo. W. West, superintendent motive power New York, Ontario & Western; second vice-president, W. L. Hoffecker, superintendent motive power Central Railroad of New Jersey; third vice-president, Thomas Alcorn, division master mechanic West Shore; secretary, H. G. Prout, editor *Railroad Gazette*; treasurer, C. A. Smith, Union Tank Line.

At the monthly meeting held Dec. 17, Mr. Ennis, master mechanic New York, Susquehanna & Western, brought up the question as to whether or not there should be a labor charge made for putting on a brakeshoe or putting in a brass on a foreign car. The following resolution was adopted: That there should be no labor charge made for putting on a brakeshoe or putting in a brass in a foreign car, and that a modification to this effect should be made in Rule 8 of the interchange rules.

The subject for the next meeting will be the care and maintenance of air brakes in freight service.

The fastest run ever made between New York and Washington was accomplished on the Pennsylvania railroad on Nov. 28. The train was a special, chartered by the proprietor of the Hotel Cochran, of Washington, to convey a party of hotel proprietors and other guests to the opening of the hotel.

The train was composed of three cars and weighed 250,000 pounds, and was pulled by engine No. 340, a Pennsylvania class "K" engine, with 6 foot 6 inch driving wheels, and weighing, with coal and water, 153,000 pounds.

The train left New York at 2:49 P. M. and arrived at Washington at 7 P. M. Changing engines at Gray's Ferry took five minutes, and six more minutes were lost at Baltimore. Deducting the 11 minutes thus lost the actual time used in covering the 228 miles was 240 minutes, four hours, an average speed of 57 miles per hour.

The first 91 miles from Jersey City were run in 88 minutes, an average speed of 62 miles per hour.

Personal.

Mr. E. Burton has been appointed master mechanic of the Florida Central & Peninsular Ry.

Mr. Nelson Robinson has resigned as vice-president of the Lake Erie & Western Railroad Company.

Mr. H. R. Bishop, President of the Duluth & Iron Range, has resigned on account of ill health.

Mr. W. M. Greene, formerly general manager of the Big Four, has been elected secretary of the Griffin Wheel and Foundry Co.

Mr. George H. Vaillant, second vice-president of the Erie system, has been elected vice-president of the Hocking Coal and Iron Co.

Irving H. Young, formerly for several years purchasing agent of the New York Chicago & St. Louis Railroad, died in Clinton, Ia., Dec. 8.

Mr. William C. Allison, president of the Allison Manufacturing Co., of Philadelphia, freight car builders, died suddenly on the evening of Nov. 30.

Mr. John J. Burns, superintendent of transportation of the Denver & Rio Grande, succeeds Mr. W. A. Deuel as superintendent of the first division.

Mr. Gabriel Morton, treasurer of the Mexican National Railroad, has been elected second vice-president, with headquarters in the city of Mexico.

Mr. M. J. Carpenter, who has been vice-president of the Duluth & Iron Range, has been chosen President of that road to succeed Mr. H. R. Bishop, resigned.

Mr. William T. Garrell, foreman of the Philadelphia & Reading shops at Reading, Pa., has been appointed assistant master car builder of that road at Reading.

Mr. James Durand, formerly general superintendent of the Hartford & New Haven, and of the Houston & Texas Central, died at Avalon, Pa., Nov. 25, aged 72 years.

Mr. W. A. Deuel, superintendent of the first division of the Denver & Rio Grande, has been appointed general superintendent of the Gulf division of the Union Pacific.

C. C. Reynolds has been appointed assistant superintendent of the Eastern Division of the Chicago & Erie Railroad Company, with headquarters at Huntington, Ind.

Mr. J. O. Van Winkle, superintendent of the I. & St. L. division of the Big Four, has resigned to accept the position of general superintendent of the Terminal Association of St. Louis.

Mr. Clement F. Street, chief draughtsman of the mechanical department of the Chicago, Milwaukee & St. Paul Railway, succeeds Mr. Marshall as mechanical editor of the *Railway Review.*

Charles W. Cross, for many years assistant master mechanic of the Pennsylvania road at Fort Wayne, Ind., has been promoted to the position of Master Mechanic in charge of the shops at Altoona, Pa.

Mr. Henry Riddle has retired from the position of general foreman at the Allegheny shops of the Pennsylvania Company. Mr. Riddle has been connected with the Allegheny shops for 30 years, and has been assistant and general foreman for the past 25 years.

Mr. Amos Root, of Jackson, Mich., died recently at his home, aged 76 years. Mr. Root was identified with much of the early railway construction of Michigan, and was the organizer of the old Grand River Railroad which now forms a part of the Michigan Central.

Mr. J. D. Moore has been appointed general superintendent of the Union Pacific lines in Texas, vice Mr. O. O. Winter, resigned. Mr. Moore is an old Union-Pacific man, having served as construction, freight and passenger conductor, and freight agent at Grand Island. His headquarters will be at Fort Worth, Tex.

Mr. L. M. Schwan was this week elected vice-president of the Lake Erie & Western, to succeed Mr. Nelson Robinson, who declined a re-election. Mr. Schwan has been secretary and treasurer of the company for many years. In his promotion the directors express their appreciation of his faithful and intelligent services.

Mr. George C. Smith has lately returned from Uruguay. Mr. Smith was formerly chief engineer of the Chicago, Burlington & Quincy Railway, and resigned that position in December, 1889, to accept a flattering offer to take charge of the construction of the State railways of Uruguay. The government of Uruguay, like all other South American countries, has suffered financial difficulties during the past two years, and the construction of its railways has been suspended in consequence. Mr. Smith is an exceptionally able and reputable engineer and is at present open for engagement.

Mr. A. C. Bassett, who was for many years manager of the coast division of the Southern Pacific, is now identified with the Bitumen Consolidated Mining Co., of California, as its secretary. The company is engaged in the mining of a bituminous rock, plentiful in California, which is being largely used for street paving purposes.

Mr. Waldo H. Marshall, for several years mechanical editor of the *Railway Review,* has resigned that position to become editor of the *Railway Master Mechanic,* with headquarters in Chicago. Mr. Marshall is an able mechanical engineer, a graceful writer, and a pleasant gentleman. And these are the qualities that insure his success in his not altogether new field of labor.

Mr. Angus Sinclair, secretary of the American Master Mechanics Association, and formerly editor of the NATIONAL CAR AND LOCOMOTIVE BUILDER, is now located at 912 Temple Court Building, New York City. Mr. Sinclair is now engaged jointly with Mr. John A. Hill in the publication of *Locomotive Engineering,* in which undertaking his many friends wish him all possible success.

Mr. R. J. Gross, of the Brooks Locomotive Works, has lately returned from a trip through England and Scotland, during which he visited the leading locomotive and railroad works. Mr. Gross was commissioned by the Department of Transportation Exhibits to secure information for the department. The London & Northwestern, it is said, will make a large exhibit of locomotives and cars.

George Henry Griggs died in New York City Dec. 9, 1891, aged 59 years. He was the son of the late Geo. S. Griggs, the first master mechanic of the Boston & Providence Railroad. In early life he entered the service of that company as apprentice in the machine shop. He had a diverse and extensive experience in railroad and other mechanical matters, having held the position of superintendent and master mechanic of several railroads. His last work was as superintendent for the Asphaltic Slag Paving & Roofing Company, from which position he recently retired on account of failing health. It was at the office of that company that the summons came. Swiftly he passed from a world of change unto the Eternal, leaving a host of friends with many pleasant memories.

Description of Inset.

In addition to the engravings and drawings of the standard Pullman sleeping car of this issue, we show on our supplement page two perspective views of the Pullman cars which run between New York and Chicago on the well known Pennsylvania Limited.

One of these engravings represents the rear of the train. The last car is a combination sleeping and observation car, that is, the main portion of the interior is fitted up like a parlor car, and has large bay windows at the sides. Adjoining this is a room which is open to the rear; this is the part of the car shown in the engraving. The platform is made a part of this room by applying trap doors to the stair openings and surrounding the whole with an ornamental brass railing.

The other engraving referred to is a view of the interior of the main room in the combination baggage and smoking car of the same train and which is placed next the locomotive. This room is finished in quartered oak, is well equipped with plush covered easy chairs and sofas, tables, etc. There are also well filled book cases, writing desks and a sideboard. The floor is handsomely carpeted and the windows and partition openings supplied with silk plush draperies.

Adjoining the main room is an annex which is used in connection with the smoking room, and in addition contains sleeping berths for the attendants. The main room is in the center of the car, one end of which is utilized for a barber shop, closets, etc, and the other for baggage. The baggage compartment also contains the air pump, the dynamo for furnishing the electric light with which this train is equipped and the brotherhood engine for driving this.

The Oldest Railroad Mechanic.

It is said that the oldest living railroad mechanic in the United States is William H. Schultz, who is now 87 years old. He was born in Bremen, where he learned to be a machinist. While working there he met an American from Baltimore, for whom he made a small printing press during his leisure hours. When he was about 27 years of age he sailed for this country, and landed at Baltimore. He got employment in the only machine shop in Baltimore, which was then on Federal Hill. Early in the '30's he drifted to Philadelphia, and became master mechanic for the Philadelphia, Germantown and Norristown Railroad Company. He had charge of all repairs, and while there built three locomotives—the "General Jackson," the "D. L. Porter" and the "James Buchanan." He also ran engines on several occasions. He ran the first mail train to Reading from Philadelphia, and brought the first cars of lime from Norristown kilns to Philadelphia. The locomotive then weighed about seven tons and a half, and Mr. Schultz made quite a stir at one time by pulling 35 four-wheel cars in one train.

It is claimed that he invented "lap" for the locomotive slide valve, and that when he first tried the valve its success was a revelation to the mechanics of that time.

In 1838 Mr. Schultz went to the Norris Locomotive Works. In 1839 he was sent to Prussia to deliver two locomotives that had been ordered by Frederick William III. They were the "Prussia" and the "America," and were to be run on the railroad—the only one in the country—from Berlin to Potsdam, a distance of 16 miles.

When he arrived at Berlin a Commission was appointed to examine the engines. They weighed about ten tons, and had a single pair of driving wheels. The boilers were intended to stand a pressure of 100 pounds, but the Commission decided the pressure should be only 45 pounds. To make assurance doubly sure they had an extra safety valve put on each locomotive. Mr. Schultz was afraid that the locomotives would not do the work required, and he did not want the valves. He said nothing, but kept on thinking. One night he went to the house where the locomotives were kept, and screwed down the extra safety valve. "It was so tight," he said, "that 1,000 pounds of steam would not have moved it." The next night he fixed the other valve the same way. On the trial trip the engineers were surprised at the excellent speed made under an apparent pressure of 45 pounds of steam.

Mr. Schultz remained one year in Berlin, and then went to Russia, Emperor Nicholas I. having offered him $6,000 a year and a house to take charge of the railroad that ran 18 miles out of St. Petersburg—the only road in the country. He remained there 12 years, the line from St. Petersburg (400 miles) being built during that time.

An English Palatial Car.

A short time ago one of the leading British engineering journals in criticising the design of a new sleeping car for the Canadian Pacific made the statement that the car could not remain on the track in passing curves because it was too long. The car was shorter than many palace cars that are running successfully on this continent. The mistake of the English paper was natural, for it is accustomed to dealing with large passenger cars that would be considered remarkably small in this country. In fact the British palace cars are only about the same length as our ordinary freight cars. The kind of car that is regarded as a wonder of size and elegance on the other side of the Atlantic is thus described in an English railway journal:

"A new saloon car built by the Furness Railway Company is worthy of notice, because not only is it quite unique in its arrangements, but it is one of the most sumptuously and elaborately fitted up saloons to be found on any railway in the country. The car is 34 feet 6 inches long, and is practically divided into four compartments, exclusive of lavatory and closet accommodation. One end is set apart for a baggage compartment and accommodation for the conductor, and is fitted with the ordinary hand-brake and vacuum brake. The car can be placed in the middle of a train, or placed at the rear end, and made into a 'slip' car; that is, it can be slipped off at any station without stopping the train or slackening speed. The compartment is lighted by about eight windows. The wood is grained a light oak and the floor laid with linoleum, the windows being fitted with blinds. A sliding door in the partition opens into a cosy compartment seated for four persons—that is a seat on each side of the doors, the other door leading into the main saloon. The seats are of polished walnut, upholstered in fine black blue cloth; the doors are also covered with the same material, with gold moldings. The sides, ends and roof are very neatly decorated with Lincrusta panel work in cream and gold. Over each seat and window are beautiful photographic views of scenes in the Lake District. The panels in the saloon and *coupé* contain figures and wild and domestic animals in dull gold. Access may be obtained from one end of the car to the other by means of sliding doors, which may be closed when the privacy of any compartment is desired, although each compartment has independent access from the outside. Beyond the baggage compartment are an elaborately fitted up lavatory on the right of the passage, and a closet on the left. Light to these is obtained by figured frosted glass windows, in which are the arms and monograms of the company. At night they can be lghted with lamps. These two apartments are supplied with water from a large cistern placed near the roof. The next sliding door opens into a small boudoir drawing-room, fitted with lounging chairs and couch, all upholstered, and a walnut table. The sliding doors are covered with the same material, relieved with gold moldings. All the inside woodwork is polished walnut. The sides and ends are covered with a Lincrusta dado about 3 ft. high, of a rich chocolate color, the remaining portion, together with the roof, being covered with Lincrusta work in cream and gold, and fastened with polished walnut moldings. All around this apartment are views of lake scenery, etc., in red carbon. The light is said to be excellent, and at night the room is illuminated by two 10-in. lamps from the roof. The floor is covered with a Wilton carpet. The next and last sliding door opens into a *coupé* in which are two lounge chairs upholstered in the same material as the saloon. A good view of the country is obtained from the two windows at the side and three at the end. The saloon runs on six wheels, and, in addition to the ordinary springs, is slung on suspension links with india rubber rings as a supplement to the springs."

The Western Railway Club.

At the November meeting of the Western Railway Club, held in the club rooms, Rookery Building, Chicago, President Peck occupied the chair.

An interesting discussion of Mr. J. N. Barr's paper on "Treatment of Waters Used in Locomotives to Prevent Incrustation" was participated in by Messrs. Forsyth, Gibbs, Herr, Lewis and several other members. Mr. Barr was absent.

Mr. Forsyth mentioned that while Mr. Barr's paper showed the success attending the use of the chemical purge on the Chicago, Milwaukee & St. Paul road, as indicated by the manner in which it had kept the firebox and flues clean, nothing was said about the economy following its use, and before going into such a practice he should wish to know about the cost. In calculating on the cost the value of the chemicals, the value of the fuel burned to heat the water blown through blow-off cocks, and that carried to the cylinders because of the foaming in the boiler, should all be considered. On the other hand there is the economy due to better evaporation when heating surfaces are kept clean.

The ideal arrangement would be to purify the water in the stationary water tanks instead of the locomotive tanks. This would do away with several objections to the plan when carried out on locomotives. "I have always thought that the locomotive is not the place to establish a chemical laboratory. It should be supplied with fuel as concentrated as possible—that is, coal having as great an amount of carbon or hydrocarbon as you possibly can get—and with water just as pure as can be obtained. There is enough to do on a locomotive after you get those without trying to carry on other processes."

Mr. Gibbs said that the cost of the purge was four cents per gallon, varying slightly with cost of chemicals, and that for a trip on the Chicago division, 85 miles, it would cost about eight cents to purify the water for the trip. As to the purification of water in other places than in the locomotive boiler, he agreed with Mr. Forsyth.

Speeking of his experience in regard to the purification of feed water, Mr. Gibbs said that he had never seen any advantage in the "so-called 'mechanical' process," or forms of apparatus in the boiler, the amount of water evaporated in locomotive boilers being so large and the rapidity of the feed so great, that in going through these purifiers it is liable to carry the sediment into the boiler.

Mr. McNaughton said he has three mechanical purifiers in use on his road—two Field and one Barnes, and for the past nine months had one of each running with water similar to that used by the Milwaukee road, and as yet they show no scale formation. Another had been running for 20 months, but with comparatively good water, and showed no scale formation. His engines equipped with mechanical purifiers run about 5,000 miles without washing out, while the boilers without purifiers average about 1,500 miles between times of washing.

Mr. Smith (C. & N. W.) uses the Smith boiler compound, about a gallon every time the boiler is washed out, and it seems to do good service. The engines supplied with the compound and those not supplied make about the same mileage, 1,000 miles, between washings out unless the water is bad.

Mr. HERR: In regard to the point brought out by Mr. Forsythe as to the economy in the use of this purge, I would say that we have as yet no definite figures showing what ecomomy this compound will give. We do know, however, that it will largely decrease the boiler work necessary in calking flues. Last year at this time our boiler work in the Milwaukee roundhouse was very much greater than it is at present; in fact, it is an exceptional thing now to call a boiler maker in to calk flues, whereas a year ago we would have two or three in the roundhouse nearly all the time. We handle about 120 engines at that point. There is no doubt but a certain amount of heat is wasted in blowing out, necessary to rid the boiler of the sediment that is thrown down by the purge. Of course this is partly offset by the increase of evaporating power due to the clean sheets and flues.

There is no doubt that this purge will clean a dirty boiler. I have had boilers that were quite heavily scaled (as much as one-eighth of an inch on the firebox sheets), and they are now entirely clean, as a result of using the purge. One peculiarity about the compound is that it seems to attack the scale on the hottest sheets first. The sheets of the firebox will be the first ones to become clean, next the flues, then the shells, and lastly the bolts and braces.

The purge was not used at first as it is at present; instead of a definite quantity being put in at the roundhouse and none by the engineer, we instructed the enginemen to put certain quantities in the tanks at certain places on the line, and then we had considerable complaint from the engineers in regard to the foaming caused by the use of the compound. On many divisions the complaints from foaming have now entirely ceased, and I have not heard a complaint from the Prairie du Chien and La Crosse divisions (where the water is particularly bad) for upward of a month, in the face of quite a heavy business. My experience leads me to think that the foam is due principally to the sediment that is thrown down, and not the compound that has been introduced. To demonstrate the correctness of this idea, I had an extra large amount of the compound introduced in some of the engines, and watched their performance carefully. As long as the engine was clean—that is, after a boiler washing—no foam was caused, but often before the round trip was completed the boiler gave some trouble from foaming, due, I think, to the precipitation of the very fine sediment thrown down by the purge.

Mr Lewis said he believed it was a hopeless task to expect to gain any material benefits from the chemical purification of water in a locomotive boiler, and that if it is possible to chemically purify water, it should be done before it enters the boiler.

I cannot understand what there is in this chemical that will assist in keeping the flues and firebox tight. We generally consider that anything that will start the scale will open up the leaks. Now, there is surely nothing about soda or potash that is going to plug up any leaks, and if any leaks exist in the firebox I doubt if those ingredients are going to close them. While I am free to admit that the showing Mr. Barr makes of the engine between Chicago and Madison is a remarkable one, I am not willing to believe that it is due entirely to the chemicals used. I believe there is more benefit derived from blowing out the boilers than there is by purifying the water by this chemical and then attempting to wash it out. Now we know that in marine engine practice the proper use of the blow-off cock is important. When an engineer comes on watch his first duty is to test the density of the boiler water. If, by the use of the hydrometer, he find that the water contains more impurity than is allowable, he immediately opens his blow-off cock and reduces the density of the water in that way. Now any benefit that is shown in this case in locomotive practice I think to be more the result of blowing the water off than of the compound, and I think if more care was employed in using the blow-off cock and relieving the boiler of these impurities before they have a chance to deposit themselves, we could get much better service out of our boilers.

For the last year or more I have made a practice of using coal oil. When a boiler is washed out, and before it is filled with water, I have a gallon of coal oil poured into it, and as the water rises in the boiler the coal oil floating on the surface deposits itself on the surface of the iron. There is no chemical action about that; we know that coal oil is very penetrating; that you can take a block of cast iron of reasonable size and pour a little coal oil on it and it will permeate through that block. Now, my idea about the coal oil is this: That it will permeate the scale or go between the scale and the iron, lifting it from the iron, and then the expansion of the boiler, due to heat, will crack off the scale, and it can be removed when the boiler is washed.

Mr. HERR: I did not intend to say that this compound would stop leaks, but we all know that if we keep all sheets free from scale and free of mud, the flues will not leak until they are actually worn out and the beads worn off. That is what the purge does. It keeps sediment away from our flues, and consequently prevents overheating caused by the accummulation of sediment and scale.

Mr. GIBBS: Nearly ever master mechanic will say, "Yes; I have experimented with this, that or the other compound, and have never had any beneficial results." I will say that I think that was because it was not used intelligently. He did not know what it was, and the man who gave it to him knew nothing about the character of the waters to be purified. Now is that a fair way to try any device—mechanical or chemical? I say it is not. Now, we know this compound will do certain things. It is not a matter of guess work, it is matter of experience on our road. In the face of the ts, I do not believe any master mechanic can afford to overlook our results. If you ask us whether we can purify the worst waters in the country, I will say, we may not be able to do so, but most roads do not have those waters. The master mechanic will talk about the evils resulting from scale in the boiler. Every one can see that if this is an evil it can be easily obviated by the intelligent use of this compound. Mr. Lewis spoke of coal oil. Oils have been advocated many times for preventing scale in boilers. Their action, as Mr. Lewis states, is to break up the scale that is there and prevent scale afterward. I believe this practice is very questionable, for experiments show that any film of oil on a plate is liable to permit of serious overheating of that plate.

The Central Railway Club.

At the November meeting of this club, held at the Hotel Iroquois, Buffalo, President Eugene Chamberlain occupied the chair. Following the roll call, the president expressed his gratification at seeing so large an attendance. It evinced continued interest in the club, and was an encouragement to all concerned.

The report of the committee on

WHEEL GAUGES AND WHEEL DEFECTS

was presented by Joint Inspector J. R. Petrie, and was accompanied by diagrams and sections of wheels with worn flanges. The committee recommended alterations in the gauge which will allow wheels to run with sharp flanges that are not worn vertical, or to such an extent as to make them unsafe, while at the same time the gauge enables each inspector on its application to determine whether the wheel should be condemned. The report stated that in applying this improved gauge on eight pairs of wheels taken out by the Nickel Plate, five pairs would have passed inspection.

Mr. Waitt believed the matter to be of sufficient importance to allow each member by personal tests to determine for himself the advisability of the proposed change. He therefore moved that a copy of the report accompanied by a blue print of the diagrams be sent to every member, and a further discussion of the subject be deferred until the next meeting. The motion was carried, and under another motion by Mr. Waitt the committee was continued, with the request that they make any further recommendations in regard to the radius that might be suggested as a result of the comments made by members at this time.

Mr. Brown moved that the committee also investigate and report whether the worn portion of the tread of a wheel is found horizontal, with a view to determining the value of the proposed gauge. Carried.

The report of the committee on

WRONG DRAWBARS

was presented by Mr. Waitt who stated prefatorily that replies to communications sent to various roads had been received from a territory extending from the Atlantic to the Pacific, and a remarkable harmony of opinion had been found on the subject.

The committee reported as follows:

There is perhaps no one class of defects or wrong material met with in car interchange, in connection with which there is such a diversity of opinion and practice among inspectors as the subject of wrong drawbars. It is doubtless a fact that there are hardly two railroad companies in the United States which are using the same style and size and shape of link and pin drawbars. Each road clings tenaciously to its own particular shape as being just a little superior to any other, but they are all of a style which has by the general vote of the M. C. B. Association been superseded by a superior type of coupler, which is in its highest type automatic and does away with the link and pin which is such a large source of expense at present on our respective lines. In the opinion of your committee everything consistent should be done to further the adoption of all recognized standards adopted by M. C. B. Association; and the perpetuation of styles of equipment at variance with such standards should be avoided and discountenanced by all who have the best interests of railroad management at heart. The M. C. B. Association having adopted the vertical plane coupler of the M. C. B. type as their standard, and as it now stands before the country as the safest and best type in use, and as all State legislation of the past few years and the recommendations made to Congress point toward the compulsory use on all cars of couplers of this type, we believe that one of the most important needs of the present time is to adopt and use only the best styles of the above coupler and to consign to oblivion the many devices in this type of coupler that are not worthy to be perpetuated. As a large portion of the present older equipment of the country is fitted still with the link and pin coupler, it becomes necessary for the present, as a matter of justice, to consider the best way to handle the replacements of such drawbars as become broken without wronging the companies owning the cars. We find the link and pin drawbars differing from one another in three different ways, each one of which may have a proper claim for recognition.

First—Different materials of which drawbars are made, as cast, wrought and malleable iron and steel.

Second—Different dimensions and weight of drawbars.

Third—Different methods of securing back end of drawbar to the draught rigging, as by a spindle or pocket strap, or continuous coupling rods.

Each of the above classes of differences is such as concerns the cost and strength of the parts, and should be given recognition in interchange, but your committee can see no possible advantage of each road perpetuating in its own cars the particular detail of curves and angles and minor dimensions of its drawbars, provided that in the place of a broken one a drawbar is substituted corresponding in material, general dimensions and method of attachment to the one removed.

We also believe in the matter of dimensions that the only essential features are that the bars should correspond in, first, length from end of head to first follower plate, but permitting use of a bar not over 2 inches longer than the original. Second, depth and width at outer yoke in carrier iron, permitting each to be one-fourth larger or smaller than original. Third, length and width of pocket and size of iron, forming pocket. Fourth, diameter and length of spindle. In conclusion, we would recommend the adoption as the sense of this club, and the practice by the members of this club, and such others as may be willing to do so, of the following rules in regard to wrong drawbars. Hereafter in the interchange of cars with connecting roads, cars having "mixed" or wrong drawbars will be received without a defect card, if they are in good condition and fit properly, except in the following cases:

First—Cars having an M. C. B. standard drawbar replaced by one of a different type.

Second—Cars having a link and pin drawbar replaced by one made of different meterial.

Third—Cars having a link and pin drawbar replaced by one having a different methed of attachment to draft rigging.

Fourth—Cars having a link and pin drawbar replaced by one of essentially different dimensions and weight.

In each of the above cases an M. C. B. defect card may be required from the delivering road covering the wrong drawbar, the card to show in what general manner the replaced drawbar differs from the original which was in the car. We would further recommend that this club forward these rules to the proper committee of the M. C. B. Association as the sense of this club, and recommending that they be incorporated in the M. C. B. rules of interchange at their next revision.

On motion of Mr. MacKenzie the report was accepted,

Mr. Miller moved to adopt the recommendations of the committee.

Mr. Waitt made an earnest appeal for the support of the M. C. B. Association, and urged that nothing should be done which would tend to negative it or render it inoperative. His remarks were warmly applauded.

Mr. Adams said that in general he agreed with the report of the committee, but it should be remembered that the majority sentiment of the railroad people was opposed to the M. C. B. type of coupler. Because the Association had adopted such a type, it was merely recommendatory, and did not mean that all railroads approved of it—"not by a long shot." Some of them were guided by their practice, and their judgment more than by mechanical ideas. The greater protection to life and limb was the object of getting rid of the link and pin coupler. Yet statistics for this year showed that more men had been killed since the automatic coupler came into use than by the old style. The expense of the automatic coupler was also greater in applying them and keeping them up. Many of the roads were putting on the M. C. B. type, although they were opposed to it, and his own road was one of the number. In Mr. Adams' opinion, wisdom dictated that they should go slow in this matter.

John T. Chamberlain, of the Boston & Maine, did not propose to discuss the merits of any particular type of coupler, but he did not believe in any action tending to the exclusion of any coupler that was not of the M. C. B. type. It was unwise, and such legislation was likely in time to react. He doubted very much whether the bar of to-day would be the one of three, four or five years hence.

Mr. Miller said the M. C. B. coupler had come to stay. There was nothing to fear on that point. According to what trainmen on his road said, they were satisfied with the M. C. B. type, and if no other were used there would be no trouble. In Mr. Miller's opinion the railroad companies had been too slow in applying this coupler, and had they been faster it would have been better for the traffic of the country.

Mr. Coolbaugh said that according to common belief it was supposed that the destruction of human life was being reduced by the use of automatic couplers, and it was startling to learn that this was not so; but, in this calculation he thought increased equipment and tonnage had not been taken into consideration. He wondered if a great many inexperienced men had not come into service as the result of a change in couplers and brakes. Was it not true that the link and pin coupler is not equal to the strain put upon it today, and for which it was not orignally designed? Was not this and the changed conditions as compared with 10 years ago, responsible for the loss of life and property caused by trains breaking in two and other accidents?

Mr. Adams had been conscientiously opposed to the vertical plane coupler ever since it came into use. He was a strong advocate of the Ames coupler, but found himself mistaken. It taught him a lesson, and he did not propose to put himself in a position to make another mistake. He was not irretrievably opposed to the vertical hook, nor did he say he was altogether right and everybody else wrong. Opposition to the vertical hook in New England was universal, but it was being applied because the cars came into the State of New York and were subject to its laws. While he had great reverence for legislators, Mr. Adams did not think they knew everything, because they are not practical railroad men; if they were they would not be in the Legislature, because such men have too much to do. He would give more for the opinion of the Central Railway Club than for that of the Legislatures of Massachussets and New York put together. In closing Mr. Adams said: "We are willing to submit to the inevitable, and we will do it with as good grace as possible."

Mr. Macbeth said that on the Adirondack & St. Lawrence they had about 500 cars equipped with the vertical plane coupler, which had been heavily loaded and subjected to severe service. But in six months time they had broken only five knuckles, and he did not know of a single case of personal injury. He believed in helping the M. C. B. Association in its effort to get rid of all other kinds of couplers, and in his opinion Mr. Waitt's report came nearer to doing that than anything else he knew of, although it might tend to hurt some. With all cars equipped with the M. C. B. type of coupler, it was unquestionably true that there would be less personal injury and a great saving to the railroad companies.

Mr. Mackenzie insisted that incontrovertible evidence could be produced to show conclusively that where the improved methods of coupler, draw timber, etc., are used together there can be no such thing as personal injury or broken draw bars.

Mr. West stated that 60 per cent. of the equipment of his road had the M. C. B. coupler, and 90 per cent. of breakage was the result of yard work and link and pin couplers.

The motion to adopt the recommendations of the committee was carried without a dissenting vote.

A special committee on

WORN OUT BRAKE SHOES,

consisting of Peter Smith, Robert Potts, and A. Dolbeer, in their report said:

"The M. C. B. rules governing brake shoes are all right as far as they relate to three eighths or less in center, but should be extended so as to cover other failures in brake shoes. We find a large number of brake shoes that retain the three-eighths limit in center, and are worn tapering on bottom and top ends, endangering the wear of blocks or heads; also shoes worn to very thin edge, and leaving one-third of shoe in good condition. We think such shoes should be condemned. The fact is conceded that shoes worn down one-sided interfere with the efficiency of the braking power. This is based upon the opinions of practical men of various companies, who have stated this fact voluntarily. Your committee is not in favor of turning shoes that have been worn on one side, as they are liable to destroy the wheels, as the bearing would come on throat of wheel, and interfere with proper adjustment of brakes."

On motion, consideration of the report was postponed until the next meeting.

Inspection and Care of Boilers.*

Every boiler on steam vessels in any kind of service is regularly inspected once a year and subjected to hydrostatic test as well as internal and external examination. The hydrostatic test has never obtained any great popularity on railroads, that is, to the limit employed on government test; it hardly seems reasonable to the writer that locomotive engines should only be required to stand an hydrostatic test of only perhaps 10 or 15 pounds in excess of the allowed pressure. Every locomotive engine that comes into the shop for thorough repairs is expected to go out for from 18 to 24 months' service on an average, and this slight margin of excess on the test pressure does not to me seem to be sufficient to cover possible wear, corrosion, grooving and other defects liable to develop within that space of time. The government rule on allowance for steam pressure to be carried by a cylindrical boiler is according to the well known formula—one-sixth of the tensile strength multiplied by the thickness and divided by half the diameter shall be allowed as a safe working pressure; that is to say, the working pressure is one sixth of the bursting pressure, and the test pressure which is put on being one-half additional to the working pressure makes the test pressure only one-quarter of the bursting pressure.

This is only true if the strength of the riveted joint is equal to the unpierced shell, which, of course is not the case. Various experimenters have found that taking the strength of the solid plate at 100 per cent. the double riveted double welt joint = 80, the double riveted lap joint = 70 to 72, the double riveted single welt joint = 65, the single riveted lap joint = 55 to 60 per cent. in strength—all for plates not more than 7-16th in. thick. In the case of locomotive boilers this would modify the figure given to about ⅝ or ⅓ of the actual bursting pressure being allowed for a working pressure.

With such a margin as this it is safe to say that if a boiler shows any sign of weakness under test pressure there must be something wrong, but if it stands the ordeal without any signs of weakness the margin allowed certainly insures that the boiler is good for a year's service under ordinary conditions of wear and corrosion. A well constructed boiler should have every part of equal strength so far as possible, and as a locomotive boiler is made up of a number of flat surfaces as well as circular, particular attention has to be paid to the staying of these flat surfaces, and it is generally complained that these high test pressures are most severe on these particular surfaces, but it is a fact that many marine boilers have the same kind of surfaces and the same staying, and have to stand the government test.

The writer had two years' experience in testing boilers in the service of the state, and in the course of that work a great many kinds of stationary and portable boilers were tested. In all cases where water was obtainable the hydraulic test was employed; and in spite of the fears of many of the grangers at the apparently excessive test pressure employed, there have been no accidents resulting in this state from boilers giving way as a result of an overstrain by a test pressure. The ordinary farm portable engine used for threshing purposes has a locomotive type of boiler. They are not made with anywhere near the degree of care that is used in the construction of locomotives, and the materials employed for sheets and stay bolts are very often of an inferior nature as compared with the materials used on locomotives, but the state inspection has been going on now for about six years, and the government test pressure is supposed to be used in testing them, and the freedom from explosion has demonstrated the fact that the government test is not a dangerous one to employ.

There are several boiler insurance companies doing business in this country that inspect boilers at regular intervals, but do not employ the hydrostatic test except in the case of new boilers. I do not know that they claim the hydrostatic test is in any way damaging, but it is evident that they consider a close internal and external examination to be sufficient to give them complete knowledge of the condition of the boiler. They do not, as a rule, however, have to do with boilers of the locomotive type, parts of which are, of course, inaccessible for internal examination, and my experience in the matter would justify me in saying that where a boiler can be thoroughly inspected internally there is not the necessity for the hydrostatic test, although, if opportunity was afforded, I would prefer to give the hydrostatic test in addition to the internal examination for the purpose of testing the strength of the stays and other bracing of flat surfaces. One thing that has brought the hydrostatic test into disrepute is the manner in which the operation is conducted. If during the test anything gives way in the way of braces or stay-bolts it manifests itself by a sharp report, but if the braces are already broken there may be no manifestation of it except by a slight bulging of the sheets, which, of course, requires an inspection at the time the test is on, and after the test is over a thorough internal examination is always advisable.

The point may be brought up that boilers have exploded very shortly after a test has been put on, at a less pressure than that employed in the test, but that does not prove anything against the test, for the reason that it is very possible that improper construction has been used and the boiler when heated up and under steam pressure is subject to strains due to difference in temperature which do not obtain when the boiler is under water pressure with all parts at the same temperature. A great many people object to the cold water test because it is cold, arguing that it is a harder pressure for a boiler to endure. As to that I would say that if the boiler is hot prior to the test it would be better to test the boiler with hot water and not run the risk of any strains which might be caused by sudden cooling; but if a boiler is cold the water employed for the test may just as well be cold.

The conclusion of the whole matter, if my premises are correct, is that a sufficient excess should be used in hydrostatic tests to insure safety for the length of time that the boiler is to be in service before a second test should be made; that templets or straight edges should be used to show if there is any deforming of the boiler under the pressure due to broken staybolts or improper design; that a thorough internal examination so far as possible should follow the test and that the conducting of the test should be placed in experienced hands. In railroad service it is generally convenient to have the hydrostatic tests made by the gang foreman working in union with the boiler makers, and if the inspection is carried out on the lines I have indicated there is little fear but that the results of the inspection may be relied upon.

The matter of records in this connection is very important, and there is a great deal in the manner in which they are kept. Some of the roads which have testing laboratories, now take accurate records of the character and strength of every sheet of boiler steel received on the road and into what boiler it is put, and its record in every way. When this is done, and a permanent record kept of every test made of the boiler after it is put into service hardly anything further could be desired, and the character of the different brands of steel in regard to performance can be very accurately ascertained. If all stationary and pumping boilers were also systematically tested and recorded then the boiler inspection records of a railroad would be complete.

On large roads, if the matter of boiler inspection could be placed in special hands, so that all of the tests of all kinds of boilers could be made with the same degree of care, and same process, so far as circumstances permit records could be added to in the way of character of scale, corrosion, pitting and other eccentricities to be found in the interior of boilers. The reason for placing this matter in special hands would be for the purpose of uniformity, so that the same defect found in different localities would be described in the same way. Causes could be sought and remedied very much easier than where it is left to different men over the line to do this class of work.

I might say, for the purpose of provoking discussion, that it is my belief that the cause of the great trouble experienced in this country in cracked side sheets, leaking mud rings and poor performance of tubes is in a great measure due to the manner of laying up the engine after a trip. We all know in working iron and steel, and particularly the latter, that sudden changes of temperature, either at the forge or in the boiler, are destructive of uniformity of strength and other physical properties. It is quite a general custom when the engine reaches the roundhouse after a trip for it to go over the ash pit where all remaining fire is raked out and the engine is then sent into the house; the boiler is still very hot and the dampers are no ways tight if they are closed (and that is not always the case either) and a great rush of air passes through the firebox and tubes, rapidly cooling off the boiler and particularly the lower portion of the firebox. If a piece of steel is worked in the fire it is generally annealed before being used, either in the shop or in a structure, and that is done by reheating and allowing it to cool as uniformly and as slowly as possible. Now if that is necessary is it not possible that there are physical changes in the steel of the boiler due to the cooling off under the treatment I have stated? Multitudes of stationary boilers using the same grade of water and perhaps urged as hard for steam are in daily use, but there is not the one-hundredth part of the boiler repairs done to these stationaries that there is to locomotive boilers. In stationary practice it is generally the custom to either bank the fire at the end of the day's run or at least to close all the doors and dampers and allow the boiler to cool off very slowly. If it is necessary to knock out the fire of a locomotive before housing I believe it would be an excellent thing to have covers to place on the top of the stack to effectually stop the passage of cold air through the firebox and tubes and thus to retain the heat as long as possible. I have been told of certain locomotives in this city in which the fires are not permitted to go out from week's end to week's end, the fires being banked at the end of the day's run and they have almost no repairs to do to the firebox and tubes of the engine.

* Read by Mr. C. A. Seley, at Northwest Railroad Club.

Master Car Builders' Standards.

BY MR. P. H. PECK, AT NOVEMBER MEETING WESTERN RAILWAY CLUB.

The chief fault I find with the Master Car Builders' standards is that there are not enough of them. The greater number of valuable standards we have, the less expense and delay we will have in the interchange of cars, and the repairs per car mile will also be cheapened thereby. The most of the standards now in general use refer to the trucks, such, for instance, as wheels, axles, boxes, wedges, brasses, brake heads and shoes, etc. These greatly lessen the amount of material to be kept in stock for truck repairs, and reduce the labor of the repairs or replacement of those parts to a minimum.

I believe, however, that the whole car should be standard, and every piece of it should be like that of other cars of the same capacity—one standard for a car of 40,000 pounds capacity, one for 50,000, and one for a 60,000-pound car. The M. C. B. Association should adopt such standards, and, after adoption, cars should be ordered the same as we now do axles—M. C. B. standard. Side sills, end sills, corner posts would all be uniform; in fact, every piece in the car would be standard in its dimensions, thus permitting repairs to be made quickly and cheaply. Finished members of the car frame could then be kept in stock, the railroads knowing that they would fit any M. C. B. car of a certain capacity. As it is now, to replace a corner post we have to remove the old one and make one just like the one removed. The same is true of other parts of the car; very few of them are of the same dimensions. To-day we could have in stock 500 such pieces, and they would not suit more than one out of 500 cars; if the standards I am here advocating were adopted, one piece in stock would suit any car of the 500.

Take the air brake, for instance: If its parts were not uniform for all cars, I am certain there would not be as many in use as there are now. They would be of no value off of the road that equipped them, as hose and couplings would have to be changed in order to use them, and repairs would be costly and even impossible in some cases. Manufacturers of various appliances for locomotives are making their devices so they will interchange with those of other makers. Many different makes of injectors will now interchange, so as not to require any change in piping or coupling in order to equip an engine with any one of them.

Our company has recently been equipping one of its passenger depots with steam pipes to heat coaches standing in the shed. In order to do this satisfactorily, the piping to each track that required steam heat had to be fitted with five different kinds of steam hose couplings, as there are five roads entering the depot, each equipped with steam, and each road having a coupling different from the others. This cost us about $100 more than it would had the couplings of the five roads been the same. These instances illustrate the expense which invariably accompanies a lack of uni-

formity, and we can easily imagine the trouble incident to the interchange of cars if the air brake and its hose couplings were in this condition.

The association has a standard drawbar, but about all that is standard is the contour. Some of these couplers are bad; none of the knuckles will interchange, and the uncoupling devices are in the same condition; some are on the right, some on the left; some raise to disengage the lock, some push down; some push in and others pull out. This is a matter of great importance in connection with the coupler, as train and switch men are generally in a hurry to uncouple cars, and are unable in every case to know the right move to make to uncouple, especially in the night. A steel knuckle costs as much as an ordinary cast iron bar, and in order to promote the general adoption of the coupler it is important that they should be interchangeable. The opinion of the switchmen and others is evident, from what took place at a meeting of the National Committee of Safety Appliances held in New York, Nov. 10, 1891. The President of the Switchmen's and Yardmasters' Associations informed this commitree that the switchmen and yardmen wanted uniformity. While they might differ among themselves as to the best coupler, they all agreed that uniformity itself was more important to them than the form of coupler decided upon. They, however, consider the vertical plane coupler too dangerous, as they had to go between the cars to open the knuckles, and the unlocking devices were out of order too much. I want to call attention to one fact, which goes to show that there is no occasion for such a diversity of couplers and unlocking gears. Of 19 different kinds of M. C. B. drawbar 14 of them can be uncoupled with a proper design of shaft placed across the end of the car and above the coupler. What we want is a standard type of coupler, a standard uncoupling device, a standard knuckle, and I may also add, finally a standard car.

Removing Sulphur from Cast Iron.

The increasing class in this country interested in removing sulphur from cast iron will read with interest the following process, taken from a German paper:

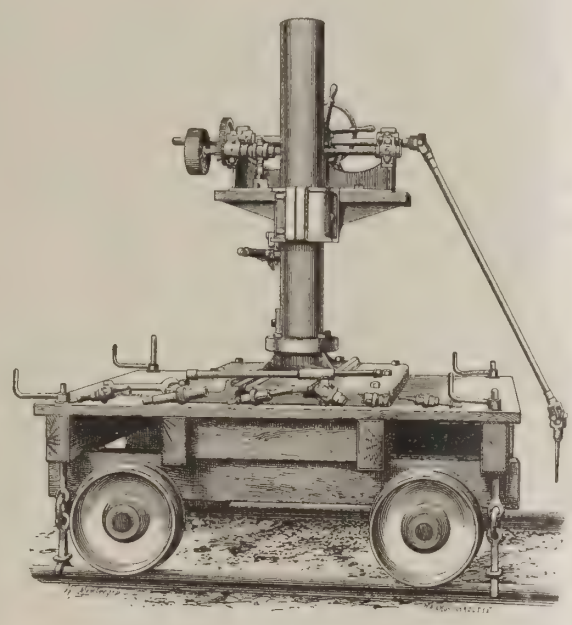
When commercial ferrous-sulphide, containing about 36 per cent. of sulphur, is melted together with ferro-manganese, the sulphur separates as a slag in the form of manganous sulphide, leaving the iron free. This reaction is utilized in a process introduced by the Horde steel works in Westphalia, for obtaining pig iron for the basic Bessemer process free from sulphur, experiments having shown that the fluid sulphurous metal from the blast furnace might, by the addition of highly heated ferro-manganese, be purified to as low as 0.01 per cent. of sulphur. The resulting manganese sulphite slag contains 20 per cent. and above of sulphur and about 50 per cent. of manganese, and when subjected to a reducing fusion with lime as a flux, ferro-manganese is recovered and can be applied for desulphurizing further quantities of metal. In order to carry out the operation successfully, it is necessary to keep the bath liquid for a sufficient time, either by its own or externally applied heat, so that the slag may separate completely. The most convenient apparatus for the purpose is a Bessemer converter, made up without tuyères in the bottom, and the operation should be completed several times before pouring, in order to obtain a large volume of slag which can then be easily removed, and to promote its separation by the stirring action caused by each new addition of metal. The results obtained at Horde in 15 trials made in August and September, 1890, are given in a tabular form, from which it appears that the sulphur in metal from the blastfurnace, ranging between 0.27 and 1.20 per cent., was reduced to between 0.034 and 0.056 per cent. in the purified metal for the converter, the charges being from 10 to 11 tons each. The sulphur in the finished steel was 0.018 per cent. from a metal originally containing 0.352 per cent., and 0.025 per cent. from that with 1.20 per cent. The effect of spiegeleisen and ferro-manganese as ordinarily used for recarburizing blown metal is somewhat similar, but is less advantageous, as being likely to unduly increase the carbon or manganese on the finished steel.

The Chicago, Burlington & Quincy have ordered some locomotives from the Rogers Locomotive Works.

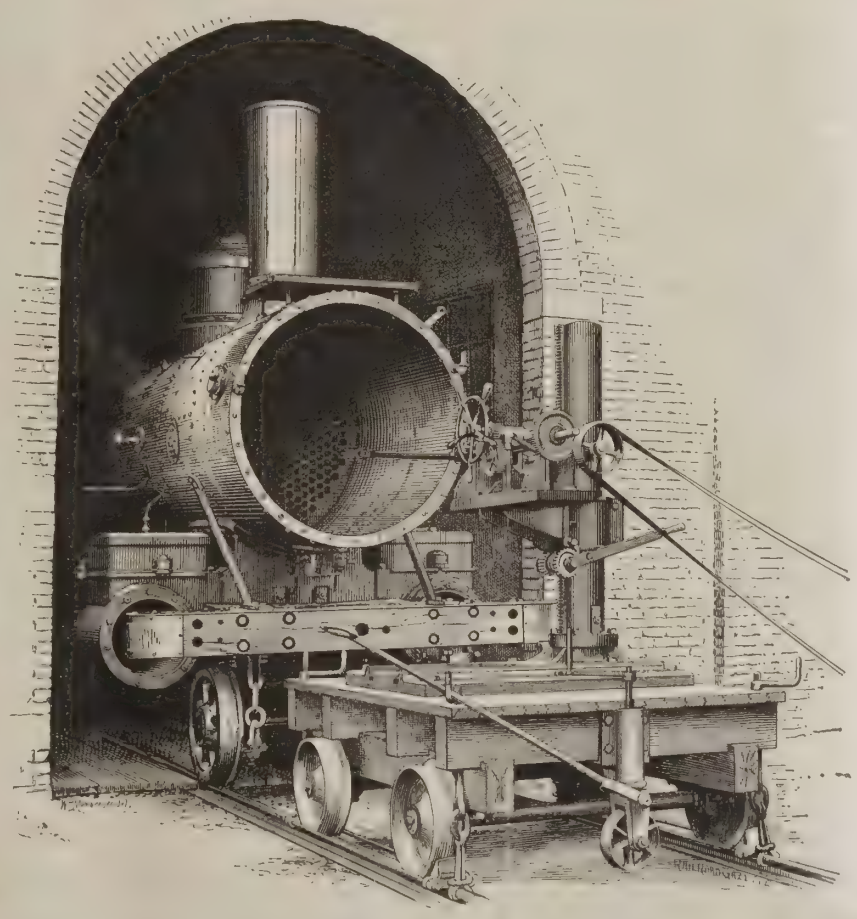
The Youngstown Car Manufacturing Company, Youngstown, O., report business as very satisfactory

Vail's Boiler Tube Expander.

Mr. Allen Vail, master mechanic of Western New York and Pennsylvania, is very meagerly supplied with repair shops and facilities for doing work, and like many other ingenious shop managers he makes the best of the situation by devising special appliances for facilitating repairs. A novel apparatus which he uses is a power boiler tube expander, hereby illustrated, for which we are indebted to the *Railroad Gazette*. Respecting the device our contemporary says it has a vertical column mounted on a wooden platform carried on four truck wheels. On the column is carried a crosshead holding a mechanism which drives a universal shaft. The crosshead is raised and lowered by means of the crank shown. There is a rack on the column and a pinion with a pawl on the crosshead. Power for the machine is derived from any convenient shafting or from a stationary engine conveniently placed. Rail clamps are provided to hold the machine in position in front of the engine, and there is at the front end of the truck a center wheel arranged to be raised and



lowered, to which is attached a tongue by which the machine can be pulled to any part of the shop. The wheels are loose on the axle on one side of the truck.



VAIL'S BOILER TUBE EXPANDER.

When it is more convenient, this machine is driven with a rawhide rope, and it is also used to tap and drill stay-bolt holes, and various different tools are used in connection with the universal shaft, the action of which can be governed by the hand wheel.

As an example of the value of this machine in a locomotive shop, it is stated that 262 tubes were expanded at both ends ready for bending in five hours, which included the changing of the machine from one end of the boiler to the other. This is a successful adaptation of power to two of the most tedious operations in locomotive boiler building, namely, the screw staying and the tube setting, and adds another useful tool to the large number which have been recently brought out for decreasing the cost of locomotives repairs.

New England Railroad Club.

At the December meeting of this club President Twombly presided. Mr. E. E. Davis read a paper on "Tools and Machinery for Railroad Shops," given nearly in full on another page.

An interesting discussion of the subject followed the reading of the paper. Mr. Chamberlain said that while Mr. Davis had presented the matter of motive power tools in good shape he had dealt but little with wood machinery tools. What was said of motive power tools applied also to wood machinery tools. The location of such tools is of great importance. He remembered being connected with a concern that had in their wood machine shop as fine tools as could be purchased, but their location was wrong. In that shop were 24 machines, and in order that the work should be moved right along from one end of the shop to the other, without going back to any machine after it had passed it, 23 of them should be changed. Forty-five minutes were consumed in running a stick through the planer, crosscut saw and tenoning machine, located as they were at first, but a change was afterward made by which the stick could be run through from the planer in six minutes; so that not only does the question come in as to what kind of shop tools should be used, but economy demands that they should be located with a view to the least handling of the materials.

Mr. LAUDER: One of the hardest things is to get an average railroad manager to comprehend the absolute need of modern machinery in our railroad shops. He seems to entertain the idea that a tool once put into a shop is supposed to stay there for life. Probably there is no such wasteful leak about the railroads of the country to-day as attempting to do the repairs necessary on rolling stock with old machinery. I was very much interested in what Mr. Davis said about screw machines. We have one now in operation in our shop put in within a year. And when I see the quantity of work which it does and the accuracy with which it does it, I condemn myself for not having had it years before. I have no doubt it would turn out, with one man to attend it, more finished product and better than any ten men can produce in the same time without it. Studs for boilers made with this machine do not have to be removed on account of leakage, as they sometimes do when they are made in the old-fashioned way, the screws cut in common lathes. The amount of saving by using such a tool is not entirely in the amount of the product, but also in the accuracy with which that product is produced; when the thread is cut right for one stud it is right for all.

In boiler shops as a rule the work for railroads is done in a very crude way. There are very few roads that can perhaps afford to use power riveters. The amount of riveting that can be done with a hydraulic riveter about a locomotive ooiler is so little that it is questionable whether there would be any saving in putting them in where only repairs are done. If there is a large building where many boilers are built, the power riveter undoubtedly would be an economical tool. There is one other tool rarely seen in railroad shops which I consider one of the most economical labor saving tools that can be put in, and that is the plate planer. Since steel plates have come into extensive use it has become almost a necessity in a well regulated railroad shop to have a plate planer. The advantage of it is that the plate is prepared for calking in a very much better manner than could be done by the finest workmau. Then, again, there is no danger of cutting the groove and weakening the parts so as eventually to produce a rupture, as there is with hand work; with reasonably careful calking the plate is left intact and of its full strength. The other tools necessary for a boiler shop—the bending rolls, shears, punches, drills, and all those things—are essential to the economical working of any shop; but how many shops we have all been in and found the tools there made in back years suitable for punching tank iron which to-day are being forced to the extent that they sometimes are broken in trying to do boiler work. It is impossible to do good work unless you have heavy, strong, well designed tools in the boiler shop as well as in the finer work of the machine shop.

Mr. ADAMS: It is sometimes said that railroad shops do not get out work as cheaply as they can contract for it. The reason is they do not have the right appliances, their machinery is old-fashioned, and the fact that machines are introduced that will do three times the work they are doing in the same time gives those who use them an advantage, and the price for the work is consequently lessened. There are many reasons given by managers why they should not put modern machinery in—money is not plenty, perhaps business is a little dull, they are not making dividends, and consequently they cannot buy new machines. They begin at the wrong end. If they would put in new appliances they would be in shape to get in money and to compete with their neighbors. I remember that 45 years ago, when machines were introduced for working wood and other purposes, the mechanics were opposed to them as taking the work out of their hands; but it is a rare thing to hear any such objection to-day. None but those very ignorant oppose anything that will save labor. They cheapen everything.

Mr. MARDEN said that when he first came to the Fitchburg road he was given liberty to buy the best machinery. It has been said to me that with the machinery we have in our shops we are losing money—the interest on the cost of the machines—because we do not have work for them all the time in repairs. I have met that argument in this way: For instance, we have a four-sided planer capable of planing sills at the rate of one a minute. We have immediately on a line with that the cutting-off saw, and further down the shop a tenoning machine, and yet further on a mortising machine, and so, when the lumber has passed through these machines, it is nearly ready for the car. Suppose we plane 50 sills in that four-sided machine in 60 minutes, and we don't use the machine for a week, I think it has paid us for the money invested, because it would take a man perhaps a week to plane those sills with an old fashioned planer. The four machines I have mentioned could be put in for perhaps $4,000, the interest on which would probably be not less than six per cent.—say $240 a year. I think any railroad company with 5,000 or 6,000 cars or more can well afford to fit their shops with machines that will take care of their work, and do it as quickly and as well as they need.

Mr. SINCLAIR: One familiar with railroad shops cannot but have noticed that there are tools used in them which no manufacturer can afford to use, and if a manufacturer cannot afford to use them, certainly a railroad cannot. There is nothing so everlasting in the eyes of a railroad manager as a tool; once in he thinks it never should go out. This is a great mistake, and is the cause of our roads having large expense in the repairs of their locomotives and cars. I think a milling machine is one of the most useful that can be put into a machine shop, and yet there is no tool that suffers so much injustice. From want of familiarity with its full use, very many of the operations to which it is adapted are not performed. Mr. Sinclair suggested that machine shop foremen should be allowed to travel occasionally and learn the labor saving methods practiced in other shops.

The PRESIDENT agreed with Mr. Sinclair's suggestion, and said: I had occasion some months ago to visit the shop of Mr. Davis, where I saw a pneumatic hoist in operation, and I went home and have built about twelve of them. It seems to me it is an invaluable tool for every shop. The following table shows their capacity:

Cylinder.	Lifts with 70 pounds.	Pressure of 100 pounds.
Four inches	658 pounds.	929 pounds.
Six inches	1,587 "	2,413 "
Seven and three-fourth inches	2,925 "	4,189 "

In drilling 30-ft. rails I had one cheap mechanic and one laborer, and they handled about 20 rails a day; but I found that one of my hoists in the blacksmith shop would change 32 rails, and the machine paid for itself every 17 days.

Tools and Machinery for Railroad Work.*

As to the work of railroad machine shops, it will be admitted by all who have given the subject careful thought, that a very large percentage of the shops are equipped almost entirely with machinery bought years ago when the road first started, and with many of the railways this gives the tools such an age that even if they were not worn in the least, their capacity for work would be such as to make them very far behind the more modern tools, both in amount and quality of the production. But when to these defects is added the wear and tear of years of service, so that the lost motion in every wearing part is such that it is next to impossible to turn out even a fair piece of work, there is assuredly a tremendous waste of money. Not only does the manufactured piece cost extra on account of the longer time required to make it, but when done it is not as good as the modern tool would have produced, and of course it will not last as long in actual service, and here is another waste of money. Then again it takes two or three times as much power to keep the old traps running as is required for a good set of machines.

Officials very often seem to hold rather queer notions regarding these things. They say, "Well, that machinery cost a great amount of money, and it ought not to be thrown away." They don't seem to realize that this old machinery has done them valuable service all through the years that are passed and that it has long since paid for itself.

Now when these old tools have done all that could reasonably be expected of them, why not let them go and take advantage of the development that has been made in all machine work, by putting in the shops the most modern tools that can be procured? Shops that omit to do this will be left tremendously far behind those that do use the most modern equipment.

What can we do with a lathe or planer made 20 years ago when comparing the quantity of work done by it with that done by machines made to-day? A planer running 10 or 12 feet per minute, with the feed so fine you can't measure it, will not answer at the present time. We want a planer to run from 16 to 30 feet per minute, with table traveling from 3 to 1. There are planers made to run 5 to 1, but I think they are under repairs about one-half the time.

We want a lathe to run from 25 to 45 feet per minute, with feed from $\frac{1}{32}$ inch to $\frac{1}{8}$ inch, according to the class of work it is on. There are tools made to-day for nearly every kind of work, and these improved tools are what every shop that has the work for them needs. In making the selection of tools for a shop, it requires a thoroughly practical man, and after they are selected, it requires as able a man to manage them.

Regarding the merits of different tools, the advantage of the screw machine as an addition to the shop equipment may be mentioned. It is without doubt, for what it can do capable of saving from 25 to 500 per cent. in the cost of work done. When a machine can be had by which you can put a piece of work through a half dozen different operations and finish it complete before it comes out, you have a great advantage over being obliged to produce the same in a lathe, where the lathe must be stopped and the tools changed for each operation; and in the case of the lathe, the uniformity of product is nowhere near equal to that of the screw machine.

In much of the work done by this tool, one machine will produce in a day a quantity equal to what four or five lathes could do with a first-class operator at each lathe.

Take the studs for a boiler for one thing; they can be finished on the screw machine in the same time that they can be drilled and countersunk for a lathe, say nothing of turning.

Very few shop managers understand to what extent the milling machine for general shop practice could be judiciously used. The idea is, that it is solely for a tool room. To a certain extent it is and was first used for that purpose, but it is fast taking the place of the lathe and planer on certain kinds of work, and the time has come when no railway machine shop is well equipped for economical work without some milling machines. Some kinds of work can be done 25 per cent. cheaper on the milling machine than on the planer, and 50 per cent. cheaper than on a lathe. Take the brass work, say a gauge cock, with the milling machine, and using an undercut cutter, with the cutter as wide as the gauge cock is long and with the same form, you can finish the whole casting with one cut, and do more work with this machine in one hour than you can on a lathe in five hours, and do it better, though there are few railway shops that as yet make any account of this machine.

One of the modern tools for heavy work is the vertical boring and turning mill; most shops do all of the heavy work on the driving wheel lathe. With the boring mill you can bore a tire quicker, and with half the help. Take, for instance, a driving wheel center; the extra labor in shifting the heavy casting around on the driving wheel lathe will pay the whole expense of fitting the casting ready for the axle with the turning mill.

Now we have another new-fangled idea, as some are pleased to express it, and that is the way of hoisting and conveying the heavy work from one machine to another, or one part of the shop to another. That is the overhead railway with the pneumatic hoist, and this hoist is as far ahead of the chain hoist as the chain hoist is ahead of manual labor.

Referring to blacksmith shop tools, there has been the same improvement here as in every other department, and I think the majority of shops, so far as they have room, have quite modern tools; in fact more so, according to the number of machines, than any other department; but there are some shops where they use the same old beam trip hammer, where you have to pull a string connected with the binder to see it go.

Take some of our boiler shops; there are men in charge of railway plants who say they can't do the work so as to compete with outside people. Well, that is right, but where does the trouble lie? Is it the lack of competent workmen in charge of the boiler shop, or is it the men at the head of the concern who fail to realize what a boiler shop needs for tools? Take a well-equipped boiler room with punch and shears, power bending rolls, and steam or hydraulic riveter, planing machine, drills, cranes and overhead railways for handling work, and this shop with a good man at the head will turn out as good work and do it as economically as any outside people can, and the production will last 25 per cent. longer. So I might go on through each department, but time will not permit. We do not find all the improvements in one shop, but we do find things that are quite amusing. One day while talking with a man engaged in turning off driving tires, I asked how long it took to turn a pair of wheels. He said, on an average, about two days; when they were very hard, sometimes four days. He had several kinds of steel for lathe tools, and when they all failed he had a piece of Mushet's steel to fall back on.

Now I don't intend to enter into a discussion as to the merits of different kinds of steel, but there are some shops that are using for 60 per cent. of their lathe and planer work, Mushet's steel, and it is cheaper than any other steel, even if it costs $3 per pound.

I have seen a man turning off a driving journal with the lathe runniug the same speed as when he turned the tire, and the lathe was a modern machine. Another shop claims to turn out 12 to 15 Master Car Builders' axles per day, all finished, ready for the wheel. Just think for a moment how fast that lathe must run.

In another shop you can see a planer 60 + 60—12-foot bed, with only one head, and running about 14 feet per minute, planing side rod brasses. For engine work 50 years ago, where a locomotive weighed about 12 tons, and where time was of no account, that planer was all right; but to-day, with 88-ton engines, it is hardly worth the room it takes up.

Another important factor in the successful operation of a railway machine shop, is the tool room. This is a place where much money can be saved by starting a thorough system of classification and arrangement. It is also highly important that this room should be equipped with all modern tools that will in any way be required, and to have enough of them so there will be no man waiting on one job while some other man is using the tool he needs; and another point is, not to expect a tool to perform a dozen different services when there should be a separate tool made for each piece of work.

* Read by E. E. Davis, at New England Railway Club.

Strength of Truck Bolsters.

BY GEO. L. FOWLER.

Having had occasion some time since to design a truck for a car of 60,000 pounds capacity, I checked my work off with that of one or two trucks, drawings of which happened to be in my possession, and was surprised to find a wide variation in their working and ultimate strengths, my own truck being about a mean of two extremes.

It occurred to me, then, that a comparison of the strength of the bolsters of trucks for 60,000 pounds capacity cars would be interesting, and I therefore procured the drawings of the thirteen trucks given in the table below with permission to publish the results in your paper.

The table shows a wide variation in the ultimate strength as well as in what I have called the safe working load. The basis upon which the calculations were made was that the bolster rested upon supports at the center of the spring pockets and that the load was to be applied at the center. No allowance was made for the width of the spring pocket or center plate, which would materially increase the strength of the bolster in every case. These widths were neglected because they varied, and it was desired to place the bolsters in a position for a comparison.

In calculating, it was assumed that the wood was white oak, to which an ultimate resistance of 10,000 lbs. per square inch of section was assigned and 3,000 pounds per square inch for a safe working load. The ultimate resistance of all iron was place at 55,000 pounds per square inch, and at 12,000 pounds for the working load. Steel at 60,000 pounds ultimate resistance and 17,000 pounds working load.

The strains on the truss rods were calculated by the graphical method and those on the beams, plates and channels by the following fomula:

$$W = \frac{8\, s\, b\, h^2}{l\, n},$$

in which

W = the load.
s = the fiber strain per square inch of section.
b = the breadth of the beam in inches.
h = the depth of the beam in inches.
n = the depth of neutral axis of beam in inches from top $= \frac{1}{2}\, h$ ordinarily.
l = the distance between supports in feet.

In the case of the Boston & Albany truck the strengths are taken from the tables prepared by the makers of I beams and were not calculated by the writer.

It will be seen from this table that most car builders seem to consider that if the safe working strain of the bolster is sufficient to carry one-half the car load with one-half the car body with a little to spare, there is margin enough; while others rise to the load of the car. All of these trucks are in actual service and they are presumed to be giving good result; but there is this to be said, in regard to the matter, namely, that the most recently designed trucks are those with the greatest strength of bolster. It is not meant that the Buffalo, Rochester & Pittsburgh truck was designed since the Delaware, Lackawanna & Western, for the reverse is the case. But I mean that the tendency is toward a stronger bolster, and this must be because the bolsters with the smaller factor of safety have been found unequal to the work imposed upon them.

From my own standpoint, it does not seem that the working load of a bolster for a car of 60,000 pounds capacity should be less than 50,000 pounds. Careless loading is apt to place a large portion of a full load over one truck, and there should be ample margin to provide for this carelessness just as there is for that in other departments of railroading.

TABLE OF STRENGTH OF TRUCK BOLSTERS.

No.	Road.	Capacity of car.	Construction of bolster.	Working load.	Ultimate strength.
1..	Chicago, Burlington & Quincy.....	60,000 lbs.	Wood, with iron plates.....	38,000 lbs.	140.000 lbs.
2..	New York, Lake Erie & Western...	" "	" " " "	44,900 "	170,000 "
3..	Philadelphia & Reading.....	" "	" " " " and 2 truss rods	50,000 "	172.000 "
4..	Illinois Central.....	" "	" " " "	42,100 "	161.000 "
5..	Pennsylvania	" "	" and one truss rod	44,325 "	192,000 "
6..	Baltimore & Ohio..	" "	" with iron plates and 1 truss rod.....	58,401 "	220,000 "
7..	Chicago, Milwaukee & St. Paul....	" "	" " 2 truss rods.....	44,100 "	165.000 "
8..	Boston & Albany.....	" "	Steel I beams....	37,100 "	131.000 "
9..	New Jersey Central.....	" "	Wood, with 2 truss rods.....	41,900 "	159,000 "
10..	Delaware, Lackawanna & Western	" "	" " iron plates and truss rods....	56,100 "	212,000 "
11	Buffalo, Rochester & Pittsburgh....	" "	" " channel bars and 2 truss rods.....	62,600 "	250,000 "
12..	New York, Ontario & Western.....	50,000 "	" " 2 truss rods.....	46,700 "	173,030 "
13..	New York Central & Hudson River	" "	" " 2 " "	51,200 "	184,000 "

Some of the innumerable friends of Mr. Morris Sellers, says the *Master Mechanic*, whose geniality "time cannot wither nor custom stale," have laughed to hear him tell of the fun he had (many many years ago, alas!) in getting a "camel" out of the roundhouse in Altoona in a hurry. It was his first, last and only experience in running one of these engines—short, but intense. He had gone to Altoona to get a position in the motive power department (in which he succeeded a few days later), and was looking over the engines in the roundhouse when "Andy" Vauclain, who had charge of all the freight engines, rushed in and ordered a locomotive to get out in a hurry to help clear up a wreck just west of Altoona. No. 52, a "camel," was ready for the road, but there was no engineer in sight, and Vauclain asked Sellers, who was then an experienced engine runner, if he would not take it out. Sellers had too much pride to suggest that he had never run a camel, and immediately went to the front end and climbed into the cab, away up on the poop deck. He says that he began to sweat as soon as he looked around. To start one of these machines was almost as much of an operation as to get a full rigged ship under weigh. The engine's valves were operated by the old-fashioned hooks, and he had first to take a long and heavy "starting bar," 13 feet long, get one end of it down into the socket of the rocker, and then work it to throw the cams until the hook "caught on."

Next he had to climb over the boiler to the other side of the cab and go through the same process on that side of the engine. Then he had to "give her steam." The throttle valve lever was a two-handed affair, like those levers with which section hands pump speed into hand cars. The lever connections had two or three right angles in them with a joint at each one, and the amount of lost motion between the handle and the valve was surprising. The latter was a "gridiron," and when it began to open so that the steam could get hold of it, it went wide open with a bang. He, of course, had had no practice in manipulating this throttle, and allowing for the lost motion in the connections, and consequently when the Irishman at the turntable said, "All ready, sure," he hoisted away on the throttle lever till it neared the roof of the cab; the valve suddenly opened wide, giving a full head of steam, and the engine started with a jump, which, Mr. Sellers says, brought his heart up into his throat. He thought surely the old camel would shoot across the turntable and go through the other wing of the roundhouse. However, he managed to shut off steam and stop her, as he thought, fairly on the turntable. And when a voice called out from below, with a rich brogue, "About four feet more, surr," he was ready to lie down and die! "If it had been four miles," he says, "I should have felt all right; but four feet! I was too proud to call for a pinch bar, and I wished that I had never seen Altoona." However, he managed to work the engine on to the table by steam, and after that he had a clear track and the worst of his troubles were over.

Colored Woods.

Almost all of the light colored woods which are used for the interior finish of the cars are liable to become darker by the action of light and varnish. Cars finished in the lightest ash show a very perceptible darkening in the course of 18 months or two years. The general tendency is to grow yellow, whether the finish be of varnish or oil, dead or bright. The lighter the color of the wood the longer the time before it reaches an unpleasant depth of color. Perfect wood, free from blemishes and light in color, is not easily found. In some sections of the country the difficulty of getting it is so great that an inferior quality has to be accepted.

Roads which run through districts abounding in fine ash are particularly fortunate, as they can get what may be called "water white" clear lumber, free from heart wood, without paying a higher price for it than the ordinary grades. Several advantages are gained by the use of very fine white woods. The first is the greater resistance to darkening which prolongs the life of the inside finish. Next in importance is the improved appearance of the car and the increase in the light at night. The difference between a dark and a light finish, as nearly as can be ascertained without actual photometric tests, is about 60 per cent. White and rock maple when first finished are lighter in color than ash. The white maple has little or no grain, and the rock, waved or bird's eye maple turns yellow very quickly. Both of them are in this respect somewhat inferior to ash. Maple contains a considerable proportion of tannic acid and is easily and quickly stained by the application of iron solutions. When stained properly it appears to hold its color well. Although not very deep in color it resists fairly well the darkening action of both varnish and light. Other woods are often stained to improve or change their color.

In pines the change of color under the action of light is due to the resin. When this is removed the wood remains white or very light in color. The resin and the yellow color by action of soap and water are entirely removed. Soda or potash solutions, followed by oxalic acid, discharge the color and leave the wood nearly white. Chloride of lime or bleaching powder can be used for bleaching. Potash in a concentrated form actually destroys wood fibre and produces great discoloration. A weak potash solution, followed by oxalic acid, is a powerful bleach and would be useful on many different kinds of wood. Chemically there should be no difficulty in removing the coloring matter from the heart wood of ash nor in bleaching any of the common hard woods used for finishing. After the color has been discharged from the wood the greatest variety of effects may be produced by straining or dyeing. The yellow browns or reds of the woods prevent the use of a large amount of the dyes which would otherwise be suitable for the purpose. With a properly bleached wood almost any transparent color could be used for a stain. There is a Japanese method of treating wood for backgrounds or ornamental work which is well worth attention. It consists in removing the softer portions of the fibre so as to leave the remaining grain in high relief. It is, in fact, a sort of artificial weathering by which the softer portions are worn away.

Extravagant Fuel Consumption.

An instance of extravagant locomotive operating has cropped up on the Southern Pacific which goes to show that it is not always unskillful or inexperienced engineers who are careless of the fuel consumption of their engines. When the Garrett & Palmer excursion was run over this railway in June, 1876, every precaution that the management could devise was taken to insure a rapid and safe run of this important train over the 833 miles of road from Ogden to San Francisco. The best engine was selected to pull the train, and the supposed-to-be best engineer on the road, who may be called Hank Blank, was put in charge, superseding the regular engineer of the engine selected, and with two crews on the engine and Engineer Blank in charge the train made a successful and unparalleled run to its destination. The skilled engineer who controlled the locomotive during this famous run came in for his due meed of praise by the daily press and the officers of the road, and for many years after Hank Blank wore the brass collar over all the engineers on the Pacific coast.

Lately, however, fuel economy has begun to receive careful consideration from the officers of the Southern Pacific, and one of the first things to which their attention was drawn was the wide difference in fuel consumption of engines doing practically the same work, on the same runs, and in about the same general condition.

Hank Blank's engine stood out as a conspicuous example of long standing of heavy coal consumption, compared with other engines on the same runs, and a traveling engineer was directed to ride on Mr. Blank's engine, and on the opposite engine engaged on the same run, and report upon the case.

The following is an abstract from his report: "At Oakland I mounted engine 201, Engineer Saulpaugh [the opposite engine on the same run with Engineer Hank Blank]. On train 35 with 14 coaches we left about seven minutes late. The fireman operated the injector, and attended to the same and his firing with good judgment. Steam was used with a wide open throttle and as short a cut-off as possible consistently with the work required. No trouble was experienced in handling the train and making up the seven minutes lost at start. There was no popping, but altogether good management by both the engineer and fireman.

"The next evening I rode on engine 92, Engineer —— [Blank], with seven cars on train 35, leaving Oakland on time. The fireman operated the injector, and showed equal care and skill in doing so, and in firing, as the fireman on engine 201. Steam was used with about three-quarters of an inch opening of the throttle and a later cut-off than was used on engine 201 with twice the number of cars. The cut-off was about 7 or 8 inches. I asked the engineer if he ever worked his engine cutting off in the next notch back. He said, 'No, she won't do the work there.' I was satisfied the engine would make the time at the shorter cut-off, and I asked him to please pull the reverse lever back to the next notch and try to make the time by giving more throttle. He did as requested, except to give more throttle, and said, 'Of course she will make the time with *this* train, we have only got seven cars.' He said nine cars was the usual train, and that his engine would not handle nine cars working in that notch (5 inches) and make the time. I told him the 201 had handled 14 cars just the evening before on the same train and piece of road, and made up time, working at an equally short cut-off, but with a full throttle. He said he did not believe in using a full throttle, or any shorter cut-off than about eight inches. He spoke of the number of years he had run locomotives, and said he had never yet seen any good from using a full throttle and short cut-off.

"And while he was telling me this, although he had just said his engine could not make the time working in the notch I recommended, and although he had not given any more throttle when he pulled the lever back, as I suggested, yet, in fact, the speed of his train increased with the engine working this way, so that he had to partly close the throttle to keep the speed down; and there was a noticeable decrease in coal consumption as soon as the engine was put working at the shorter cut-off."

The following tables show the mileage and the average cost per mile for fuel of the engines in charge of Engineer Blank, and of the other engines engaged with him on the Oakland and Martines passenger runs for eight consecutive months from September, 1890, to April, 1891.

Month.	Eng.	Engineer.	Mileage.	Cost per mile fuel.	Engines.	Total mileage.	Average cost per mile fuel
Sept.....	104	Stokes.	268	20.50	3 engs.	1,876	21.79
1890.....	172	Lightner	1,005	23.78	178	1,808	25.99
	121	Stokes.	603	21.10	.....	.....	.....
	178	Blank.	1,808	25.99	Difference	.....	4.21
Oct.....	10	Stokes.	1,072	17.52	3 engs.	2,010	19.39
1890.....	172	Garrison	871	21.56	178	2,144	23.76
	178	Blank.	2,144	23.76	Difference	.....	4.37
	200	Garrison	67	19.10	.....	.....	.....
Nov.....	10	Stokes.	469	20.71	2 engs.	1,876	22.39
1890.....	172	Garrison	1,407	24.08	178	1,877	27.18
	178	Blank.	1,877	27.18	Difference	.....	4.79
Dec.....	92	Blank.	804	31.29	92 and 178	2,077	30.22
1890.....	172	Garrison	1,943	25.15	172	1,943	25 15
	178	Blank.	1,273	29.15	Difference	.....	5.07
Jan.....	172	Garrison	1,742	22.53	178	2,144	26.39
1891.....	Sundry	.....	335	22.76	All other.	2,077	22.67
	178	Blank.	2,144	26.39	Difference	.....	3.72
Feb.....	172	Garrison	1,675	22.42	178	1,843	27.06
1891.....	200	Garrison	201	26.13	2 engs.	1,876	24.27
	178	Blank.	1,843	27.06	Difference	.....	2.79
March...	172	Garrison	1,742	23.66	178	2,078	26.55
1891.....	Sundry	.....	335	19.89	Others.	1,977	21.77
	178	Blank.	2,078	26.55	Difference	.....	4.78
April....	178	Blank.	1,977	25.98	....	.....	.....
1891.....	172	Garrison	1,943	20.47	Difference	.....	5.51

SUMMARY.

....	92 178	Blank.	15,918	.....	.....	.....	26.64
All oth's.	.....	.....	15,578	.....	.....	.....	22.91
Diff'nce..	.....	.....	.... ..	.....	.....	.....	3.73

Excess in cost of fuel for engines 178 and 92 equals 3.73 cents per mile × 15,948 miles run, equals $595.16.

All the engines whose performances are here compared have 17-in. × 24-in. cylinders, and 4 ft. 5-in. driving wheels, and there was no marked difference in the size of boilers, fireboxes, or the general condition of the engines Yet the cost of fuel for the engines in charge of Engineer Blank is in excess of that of other engines doing practically the same work on the same piece of road in the sum of nearly six hundred dollars.

An engineer employed on the railway line running between Aargau, a canton of Switzerland, and Waldshut, a town of Baden, on the Rhine, was recently discharged for some infraction of the rules of the road. He determined to have revenge. He climbed upon a locomotive, opened wide the throttle and jumped from the cab, letting the locomotive dash down the track at full speed just as a train loaded with passengers came rushing from the opposite direction on the same track. The runaway locomotive and the locomotive of the passenger train plunged into each other, both engines being entirely wrecked. The engineer and fireman of the passenger train were instantly killed. The passengers on the train were flung in all directions by the shock of the collision. Three of them were fatally injured, and nearly all the others were seriously hurt.

The Open Window Fiend.

He stood in the Grand Central Station fanning himself with his hat, and the cinders on his bald head looked like pepper on a hard-boiled egg. Every square inch of his fat short person was begrimed and dirty.

"S'pose I look like a Digger Indian just dug," he remarked, putting his head into the window at the Bureau of Information, and letting his imitation leather valise drop on the floor with a thud.

"Oh, well, a little jagged, perhaps," responded the clerk, politely."

"No jag around me," said the dirty tourist, indignantly. "I only got in ten minutes ago."

"So?"

"Yes. Haven't washed since we left Council Bluffs. Would you believe it?"

"Oh, yes."

"We had a gay time, I tell yer."

"How's that?" inquired the clerk.

"Well, you see, a feller from South Dakota opened the winder just in front of me a while after we had started, and the cinders came in like it was a Montana hailstrom. I didn't want to 'pear disobligin', so I stood it fer three hours, and then I leaned over to the South Dakota feller, and says I, 'Little dusty, ain't it?' 'Mebbe,' says he. 'Would you mind shuttin' down that winder for a spell?' says I, as perlite as you please. 'I find it very annoyin'. 'I would mind,' says he, 'and if I can stand it I'll bet you can.' 'Well, if it's a bet you say,' says I, 'I'm in it. I don't let no South Dakota feller bluff me. I'll bet you $50, even money, you'll weaken on that open window before I do.'

"He looked surprised, but he says, 'It's a go.'

"We put up the money with the conductor, and he snuggled up to his winder, and I behind, takin' the dust sorter second hand. At the end of the first 24 hours we wasn't purty fer a cent, and I see'd the other feller was squirmin' a good deal. So when the train stopped fer dinner, I sneaked out to the endgineer and gave him my last ten-dollar bill, and says I, winkin': 'When you start up the endgine it'll be a pertickler favor to me if you won't screen back them cinders; let 'em flicker for two or three hours; just buzz out every cinder you've got.'

"'My coal,' says he, a winkin' back, 'is terrible soft and muddy to-day.'

"Well, sir, the next three hours was awful. I never see'd such smoke and coal dust anywhere. The way that engine snorted and blowed, and them cinders rattled and pattered most scared the passengers off the train. It actually seemed as though the screen business had busted clean out of the smoke stack and let the coal blow through in chunks. The dirt was so thick on my face you could have wrote my name in it, but that feller from South Dakota he caught them cinders right in the neck. He was almost buried. There was cinders in his hair, cinders in his mustache; they worked down inside his collar; into his vest pockets. And when he started to brace up on a chew, blamed if he didn't bite more cinders than tobacker. And then it came up to rain, and for an hour that fellow from South Dakota looked like he was dredged up from a mud pond. When the rain stopped and he was wipin' down the mud, along came a red hot cinder as big as a pea and lit on his beard. The brakeman helped him put out the fire, but just then the train stopped and that feller riz up, and says he: 'I weaken, take the cash,' and he walked right off the train. Then all the passengers congratulated me. They said I was dirty, but game."

"So you got the money?" inquired the clerk with some interest.

"Well, that's the trouble," rejoined the dirty traveler. While I was fixin' the endgineer, blamed if that ornery cuss from South Dakota wasn't goin' me one better, an' fixin' the conductor, and they froze to the cash and skipped together The trouble with me is," added the grimy traveler, gazing out pensively at the Forty-second Street hackmen, "that I'm too honorable and confidin'; always been so. Say," he added, poking his dirty head in the window, "gimme a quarter for a wash, will yer?"—*N. Y. Tribune.*

Review.

A newly revised edition of the "Lumberman's Hand Book of Inspection and Grading" has been received. The Hand Book is a grouping of information valuable not only to all classes of lumbermen, but also to all engaged in the inspection of lumber and timber for railroad use. It would be found, in our opinion, a particularly valuable help to master car builders, and to the men they employ to inspect the building of new cars in contract shops. It includes inspection rules in all the leading markets in the country, with descriptions of dimensions and grading in each.

The present edition has a thoroughly revised digest of the lien laws of the different states in their application to logs, lumber and mechanics' liens. Besides the main feature indicated, there is a mass of miscellaneous information contained in the hand-book useful to all who have to do with lumber. The book contains 263 pages, is well bound in cloth and of a handy size for pocket, pigeon-hole or grip sack. Price, $1.25. Published by the *Lumberman*, 325 Dearborn Street, Chicago.

The Philadelphia & Reading R. R. have recently placed an order for 500 box cars with the Pullman Car Company. These casr will be equipped with the Pullman patent freight car door, manufactured by the A. B. Pullman Company, of Chicago, Ill.

The Pennsylvania road is to inaugurate a through Pullman sleeping car service via that system and its connections from New York City to San Francisco. The service will be weekly, and the first car will leave Jersey City on Jan. 4, 1892. Pullman vestibule buffet sleeping cars of the latest design will be used. This is the first regular through car line between New York and San Francisco.

Fuel Notes.

The question of the fuel to be used at the Columbian Exposition grounds is being considered. A recent estimate showed that 1,000 tons of coal per day, or 180,000 tons in all would be needed to furnish power for the machinery. Trouble would be experienced in storing such a large quantity, and there would be danger of fire from spontaneous combustion.

Oil was proposed as a substitute for coal but was rejected because of the unpleasant odor attending its burning.

Gas may be decided on as the best available fuel.

ENGLISH COAL BRIQUETTES.—In England, where pitch or other bituminous material is expensive, briquettes for fuel are formed by the use of glutinous or farinaceous matters, such as are obtained from wheat, barley, rye or other cereals, or vegetables—57 per cent. to 95 per cent. of coal dust being a suitable proportion. The mixture kneaded sets in a short time, so that molding under pressure is unnecessary, although the use of molds may be adopted to aid rapid manufacture. It is claimed that the product burns with less smoke than the ordinary briquettes, and is more economical in use. Refuse matter from coal fires, with or without fresh coal, may also be utilized.

MOLASSES AS FUEL.—The Louisiana crop of molasses is about 450,000 barrels annually, and will be a constantly increasing quantity; a larger part of it is of superior quality, which finds a ready market, and the lower grades are constantly increasing; for these lower grades there is now scarcely any market, and their value has fallen so low that the question of the fuel value of such goods has arisen; the lower grades will increase in quantity comparatively as the more thorough the manufacture of sugar is, the lower the grade of the resulting molasses. Its present market value leaves its value on the plantation at about $3.33 per ton, which price per ton is about the present value of coal in the East.

COAL CONSUMPTION IN THE UNITED STATES.—At the last meeting of the American Institute of Mining Engineers Mr. John Perkinbine read a paper upon this subject, from which the following data is taken:

An approximate review of the consumption of all kinds of fuel for the past 20 years may be obtained from the following data, taken chiefly from the census reports:

	1870.	1880.	1890.
Gross tons of anthracite coal.....	13,925,229	25,580,189	40,714,721
Gross tons of bituminous coal....	15,356,619	38,242,641	85,383,059
Bushels of charcoal.....	.....	74,008,972	90,000,000
Cords of wood.....	.....	145,778,137	180,000,000
Barrels of petroleum..... ...	5,260,745	26,286,123	34,820,306
Natural gas, value in coal displaced.....	No report	No report	$20,000,000

The fuel consumed in the United States, exclusive of natural gas, but including the coal and wood converted into gas, is estimated to require the conveyance, by various methods, of nearly 1,500,000 gross tons each day of the year (no unimportant factor in the national problem of transportation), and to demand the energies of over 1,000,000 wage-earners to mine, cut, handle and convey it to points of consumption. The fuel consumption, *per capita*, he United States, is, in calorific value, equivalent to 3½ tons of coal per annum.

THE CAUSE OF COKING IN COAL.—At the first glance it would seem strange, but it is nevertheless true, that the physical cause of the coking or fusing of bituminous coal into the form of coke, under a distilling heat, is by no means understood. By some German chemists a test has been made to connect the physical phenomenon of coking with the chemical composition of the coal, especially with reference to the richness of the coal in what is called disposable hydrogen or that proportion of it which is in excess of the quantity required to form water with the oxygen present. Unfortunately for the general acceptance of this standard for the coking quality in coal, it does not correspond with observed results. Neither does the richness of a sample of coke in carbon determine its coking capabilities; for two specimens of coal of practically identical carbon composition will often be found to behave very differently in the retort of coke ovens. If the property of coking does not reside either in the surplus hydrogen or the fixed carbon, it is certainly not to be found in the content of the coal in oxygen, which gives no indication whatever of the physical behavior of the coal under heat. Some coking coals coke without much swelling; others swell considerably in the process of coking. In either case, the coal must undergo a stage of fusion, in which it becomes a thick semi-fluid mass through which the gas escapes. Why one kind of coal should swell considerably, while another variety, of similar composition, does not, is a problem not apparently capable of solution from any of the chemical data usually preserved in analyses of coals.—*Journal of Gas Lighting.*

On December 4 a heavy wind storm prevailed in New York City, and blew down some electric light poles. One of the poles fell upon the roof of a passing street car and innumerable electric sparks began to fall about the car. There were 23 passengers in the car, and the driver said afterward that the car was emptied before he could realize it. They came flying out through the sparks, he said, as if they were a part of the fireworks. No one was injured, and the pole, catching in the telephone and telegraph wires, so eased its fall that it did not go through the roof of the car. Many of the passengers and the driver experienced a slight shock of electricity.

Pullman Cars in England.

American ideas respecting railroad rolling stock appear to be gaining consideration even in conservative London. *Engineering* has this to say in a recent issue:

The introduction on the South-Eastern Railway route to Dover of American railway cars, as described in another part of this issue, has suggested the idea that we are in this country gradually moving toward an extensive adoption of the corridor cars so largely used in America and now being adopted in some of our colonies. On nearly all the leading lines the best trains have Pullman sleeping or drawing-room cars, and in some cases dining-room cars, and we question if the first-class passenger would object, to the universal adoption on long routes. In view of the undoubted interest on the subject some figures relative to the extent of use and the production of Pullman cars in America may be given. Of course there are other makers besides the Pullman Company, but they are the largest and best known of American palace car builders. They hold contracts for 124,557 miles of railway, about 75 per cent. of the total railways open in the States. The number of cars owned by this company and running on American railways is 2,239, which is equal to about one-tenth of the total passenger cars in America, and last year 5,310,813 passengers were carried, the mileage being 186.8 millions, so that each car travelled 84,000 miles in the year, and carried in the year about 2,365 passengers, each passenger travelling 350 miles, and as each passenger over the whole system travelled but 42 miles, it is evident that in the States the Pullman car is only for long distance travelling.

American Locomotives in Palestine.

The Baldwin Locomotive Works have received the following letter from their representative in Jaffa in regard to the trial trip of one of several Baldwin engines sent there to run on the Jaffa & Jerusalem Railway, the landing of which was illustrated on page 104 of the NATIONAL CAR AND LOCOMOTIVE BUILDER for July, 1891:

Messrs. Burnham, Parry, Williams & Co.:

I am very glad to be able to report that we made a successful trial trip of the first engine ("Jaffa") today. All Jaffa was to see it, including the Turkish Governor and his court. It was estimated that at least 10,000 people were on the housestops and along the line of the road, and over two-thirds of them never saw a locomotive before. Many of the Arab women moved their household effects along the line of the road several days ago, so as to be on hand when the great thing went along. Many flags were hoisted over public buildings in honor o. the occasion. I got an American flag from the Consul and put it on the front bumper. The French engineers put two French flags on each corner of the cab, and we secured a Turkish one to put on the other bumper, and so we went up into town. I doubt if any other engine built by the works ever received so much attention as 8-24 D, 24, and as for me, well, I never expected people to regard me as the Arabs did today, and have been doing. They simply think that I have been cutting and carving it out of a lot of railroad iron and boxes. They have a great respect for the French engineers, and think them very smart, but when it comes to making a machine such as they saw to-day, "they can't do it in France, they had to send to America for a man to make it."

A Substantial Elevated Railroad.

Berlin is the only city in Europe which has an elevated railway. This belongs to and is run by the government, as are most of the railways in Germany. It carried between five and six million passengers last year, and pays well on the investment. At certain hours of the morning and evening, when it is more availed of by the laboring classes, rates of fare are very low; at other times rather higher than on the New York elevated railways. This railway, which belts the entire city, must be seen to be appreciated by those familiar with the New York elevated system and its disfigurement of the streets. The Berlin street railway is constructed with as much care and solidity as are any of the great trunk railways of the United States. Its passenger stations are more commodious and give better protection to passengers than the majority of railway stations in the principal cities of America. Instead of disfiguring the streets it is an ornament to them. When it runs on a level with the upper stories of a house, passengers have no chance to look into the windows of sleeping-rooms, for it is so managed that the tracks pass by the side walls where there are no windows. After the route had been surveyed and determined upon, the government bought every piece of property that could be in the least degree damaged. The houses were torn down so as to give clear space; the whole bed of the sidewalk, and in some instances of the street, was occupied. In order not to interfere with business, wherever necessary new outlets were opened where old ones were closed. A solid superstructure of masonry, with exterior walls presenting as finished an appearance as that of well-built houses, and ornamented at the top with arches and railings, was constructed. On this was laid the tracks; laid, as I have said, with as much care and of as durable material as will be found anywhere. Going through the most populous districts, it neither by smoke, sound nor appearance causes annoyance of any character. For miles ensconced under the massive roadway are to be found restaurants and shops where people eat, drink, sell and buy without the least consciousness of the rumble and the roar above theirheads.

The plant of the Indiana Car and Foundry Co., at Indianapolis, Ind., is for sale or lease. Information can be obtained from E. Pollack, secretary, Fifth and Vine streets, Cincinnati, O.

An illustrated catalogue of spring shade rollers, manufactured by Mr. Stewart Hartshorn, showing, among other things, photographic copies of different styles of brackets will be sent to all who may wish one. Main office E. Newark, N. J.

Mr. A. T. Shoemaker, formerly with the Troy Steel and Iron Company, and the Illinois Steel Company, has established himself in the railway supply and equipment business. His address is 146 Broadway, New York, and The Rookery, Chicago.

The Eureka Tempered Copper Company have just issued a circular entitled, "Long Stories Boiled Down for Busy Men." It consists mostly of testimonials from prominent users of their product who express high satisfaction with the same.

Mr. Chas. Parsons, for a number of years in charge of construction for the Standard Tiffney Refrigerator Car Company has resigned, and goes with the Drake & Wiers Company as general Western agent, with headquarters in Home Insurance Building, Chicago.

Mr. Frank Bakeman, of Chicago, who in addition to several other specialties is introducing the Cushing drawbar attachment, reports that he has recently received an order for 100 of these attachments, and that the prospect of doing a large business with it is very favorable.

At a recent meeting of stockholders of the Lawson Varnish Company, 392 Wabash Avenue, Chicago, the capital stock was increased from $150,000 to $200,000. As a further indication of the handsome growth and expansion of their business, they have, during the past year, enlarged their factory so that their capacity is doubled.

The Big Four Route is offering special attractions to persons contemplating a Southern trip. Solid vestibuled trains with reclining chair cars, palace sleeping cars and parlor café dining cars, all heated by steam, run daily, making connection in Central Union station, Cincinnati, with through express trains on other routes, affording practically through train service to all popular winter resorts in the South.

The requirements to be met in a durable roof for roundhouses, smith shops and similar classes of railway buildings, has long been the aim of roofing experts. Acids and gases are constantly at work from the underside, while the atmospheric changes from without add to the difficulties. These conditions, however, seem to be fully met in a material for this purpose by the Lee Composite Manufacturing Company, of New York, known as their "Permanence" brand.

Quite a ripple of excitement in railroad circles was occasioned by the bringing out of the new buffet reclining chair coaches on the Clover Leaf line. These coaches were on exhibition at St. Louis and shown up by Colonel Davenport, the genial Passenger Agent of the Clover Leaf. The buffet attachment to the chair cars is a novel introduction. The reclining chairs are the latest production of the Scarritt Furniture Company, of St. Louis, and were covered in rare designs of plushes especially gotten up for this company.

With the beginning of this year the Midvale Steel Company propose transferring their steel-casting department to their new steel-casting plant, which has been in course of erection during the past eighteen months. This plant is one of the largest that has ever been built for the sole purpose of making steel castings, and is equipped with all the latest and most approved appliances, and is pronounced to be the most complete of its kind in the world. The capacity of the plant will be 100 tons of steel castings per day, and when it is in operation the company will be prepared to make single castings weighing not less than 100 lbs., and not over 45 tons and anywhere between.

They say: With the completion of our new plant, we are prepared to take orders for a large amount of miscellaneous work, which heretofore we have been obliged to decline for lack of space.

In the course of a few weeks we propose issuing a series of illustrations of important steel castings made at these works, some of which have been remarkable, either on account of size or shape, or from the physical results obtained from the metal. These illustrations will be mailed to engineers and others desiring to obtain them, and will, we think, be of much interest, as showing the progress that is being made from time to time in the art of making steel castings in America.

Editor National Car and Locomotive Builder:

The Safety Car Heating and Lighting Company begs leave to announce to its friends and patrons that the decision of the Board of Examiners of the Patent Office, on Oct. 28, besides allowing them other patents of considerable importance, granted the two claims covering broadly the steam heating of railroad cars in connection with the Baker Heater and its circulating pipes in the application of Henry R. Towne. This application has been involved in a long interference, and is the property of this company.

No other companies have any right to apply steam heat to railroad cars which is to operate in combination with the Baker Heater and its circulating pipes, without license from the Safety Car Heating and Lighting Company.

THE SAFETY CAR HEATING AND LIGHTING COMPANY.

The New Rotary Snow Plow.

The new rotary plow herewith illustrated—nine of which magnificent machines may be seen in operation during the present season on nearly all of the prominent western roads—has been ordered by the government state railways of Germany and Russia for use on the lines of their respective countries. It is practically the old rotary in an improved form now developed to the highest state of efficiency for removing snow from railroad tracks.

Years of practical experience on the different railroads between the Atlantic and Pacific in all kinds of snow to be found, and in the worst snow blockades and the most severe storms known in the history of railroading, have afforded the opportunity of developing the rotary plow to a state of perfection, which the best mechanical skill in the world could not have accomplished without the experience which such practical work has afforded. An examination of its construction throughout proves that nothing which could promote its perfect working has been lost sight of.

The new rotary wheel is the principal improvement. In the new wheel the best possible design of cutting blades has been adopted, the important feature being to reduce the friction of the snow while passing through the wheel to the lowest possible minimum. This has been fully accomplished by the adoption of the hollow cone-shaped scoops, which, with their perfectly smooth surface, make it impossible for the snow to stick or clog in any way while passing through the wheel.

The scoops widen from the centre to the circumference, while the knives are so designed as not to cut off more snow from the bank in a single revolution than what their particular scoop has the capacity to discharge.

The hood or square front of the casing of the wheel has also been considerably modified by reducing the dead surface caused by the bell-mouth to a straight cutting edge, thus causing the wheel to stand out prominently and to come first into contact with the snow, entirely dispensing with unnecessary dead surface to be forced into hard snow.

The flanger and ice cutter have been modified in the way of reducing the possibility of wrecking them to the lowest minimum when coming into contact with crossings and frogs through not being raised in time to allow them to pass over these obstructions.

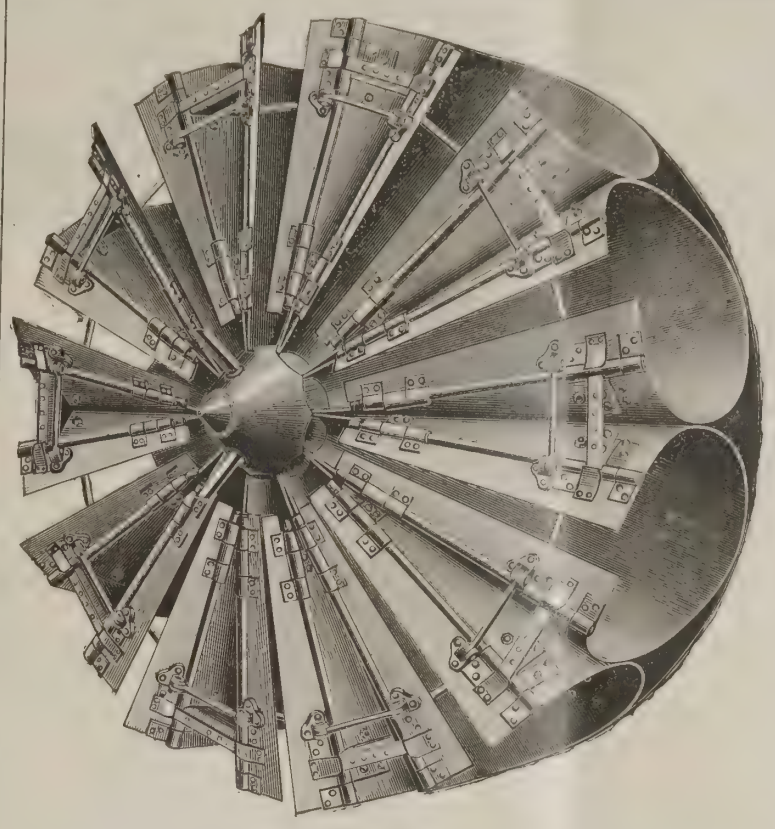
The most important feature in the new design of the ice-cutter is a shearing bolt which completely protects it from being wrecked while in service, being so constructed, that should the ice cutter strike any obstruction such as above referred to, it is naturally forced backwards, which action shears a small bolt allowing the point of the cutter to swing back sufficiently to pass the obstructions encountered without any further damage.

This bolt can be replaced in a moment or two, after which the ice cutter is intact without any further repairs.

The important feature of the flanger is that the parts which go below the rails are bolted to the bottom of the wings with suitable bolts, so that should they strike any obstruction other than snow or ice, these bolts will be broken, allowing the flanger points to become detached without any further damage.

These points can be easily replaced by duplicates carried on the machine for that purpose in a few moments, or merely while the time is taken to put nuts on two small bolts, after which the flanger is again in perfect working order. The mode of operating the ice cutter and flanger has also been much improved by connections which enable them to be raised and lowered simultaneously by an air cylinder supplied from the main reservoir, and are operated by the pilot with suitable levers in the front end of pilot house, all of which have proved to be not only a great advantage, but to be really indispensable, as it is impossible to derail the plow by either snow or ice while the ice cutter and flanger are in working order.

The trucks have also received attention in the way of increasing the strength of the arch bars and the addition of spring seats on the transoms, all main bolts being turned and having double nuts and split keys, thus making it impossible for even a nut to loosen on the trucks while the rotary is in service.



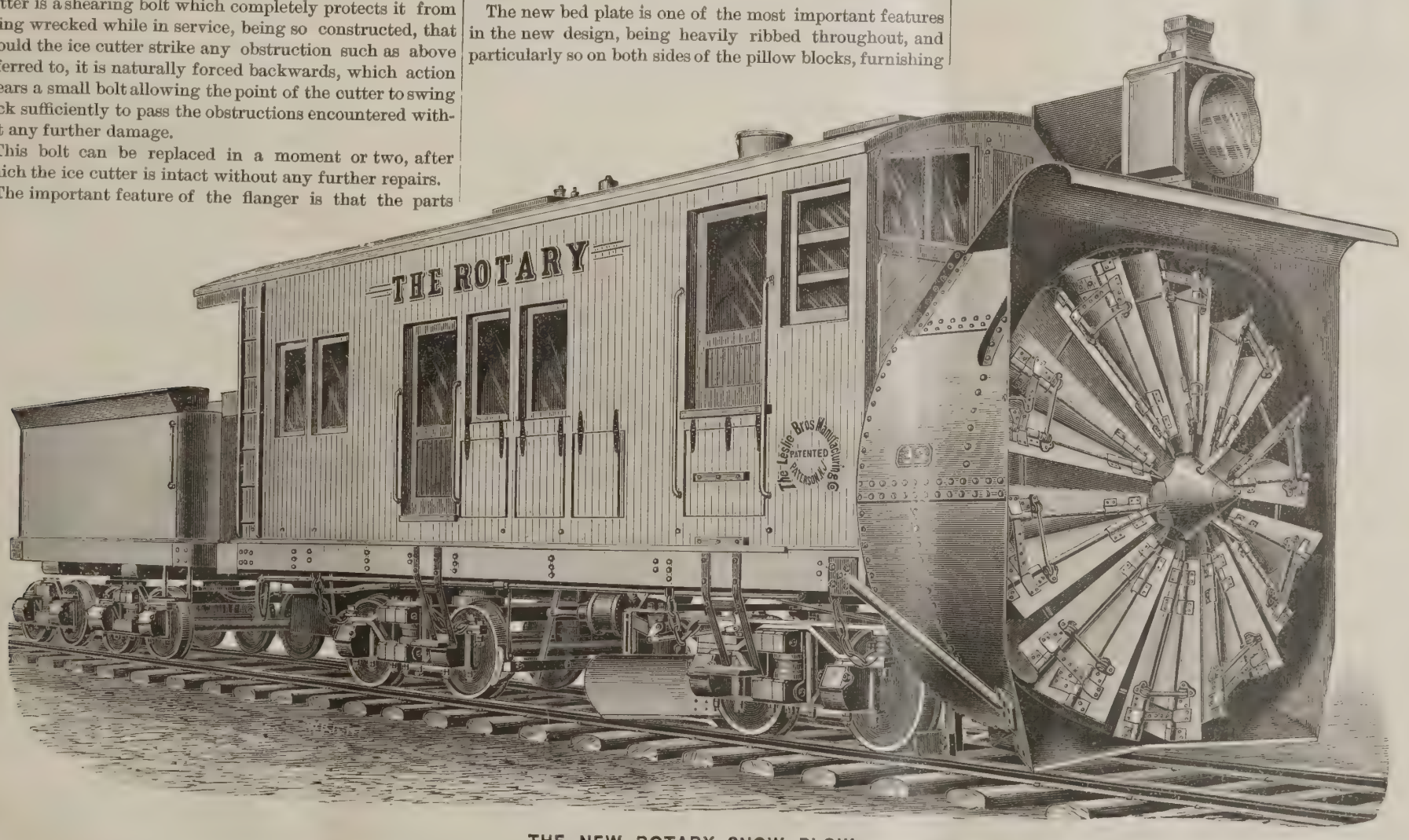
The frame has also been made very much stronger and perfectly rigid by substituting heavy steel I-beams instead of iron, also by using much deeper channel irons and substituting heavy wrought iron body transoms instead of cast iron.

The new bed plate is one of the most important features in the new design, being heavily ribbed throughout, and particularly so on both sides of the pillow blocks, furnishing an abundance of surplus strength. Another important point gained in the new bed plate is moving the main gear back in the rear of the front center bearing, thus carrying a greater portion of the heavy weight of machinery back sufficiently to secure a much better distribution of the weight over the trucks instead of having it overhanging the front center bearing. The new pattern of cycloid wheels, made of gun metal, have been thoroughly tested in the heaviest work possible to put a snow plow into, and have been proved to have a large margin of surplus strength. An entirely new design of boiler has been adopted with increased heating surface and steam capacity and has been proved to be all that was required.

Another important feature is the equipment with the Westinghouse air brake, consisting of an 8-inch quick action air pump, and an extra large main reservoir capable of supplying the air brake cylinders and also the cylinde for operating the ice cutter and flanger, being equippe with two air gauges and all the latest improved fittings an accessories.

The signal arrangements have been much improved, an the air whistle substituted in place of th gong. The comfort and safety of thos who operate the plow has not been neglec ted in the new improvements, and the ca has been much improved and strengthe ened.

All of these improvements have enable the Rotary to do its work with such ease and so much more rapidly, besides being s comfortable and so conveniently arrange for those handling it, that the trainme have christened it the "Vestibule Snow Plow."



THE NEW ROTARY SNOW PLOW.

Hard to Cure.

Vice-President George R. Harris, of the Burlington Road, as everybody knows who is acquainted with him, is a man of fine physique. His appearance at once proclaims him to be one who is fond of the good things of this life, and his enjoyment of them may partly account for the relish with which he enjoys a good joke, even when it is at his own expense. Here is one of that kind which Vice-President Harris tells on himself:

He had an acquaintance in whom he was specially interested but who had the misfortune to be a victim of dipsomania. Through the influence of Vice-President Harris this man was induced to go to Dwight and submit himself to the treatment of Dr. Keeley. After he had been there for a few weeks Mr. Harris thought he would show his interest in the case by taking a run down to Dwight and paying his friend a visit. Accordingly he got on an Alton train and proceeded to the scene of Dr. Keeley's labors. When he arrived there he was not very favorably struck with the resources of the place so far as its capabilities for furnishing the ordinary traveler with first-class accommodations were concerned, and he resolved to cut his visit shorter than he at first intended and return to Chicago on the next train. Seeing a man on the platform of the railway station he said:

"I say, my good man, can you tell me how soon I can get back to Chicago?"

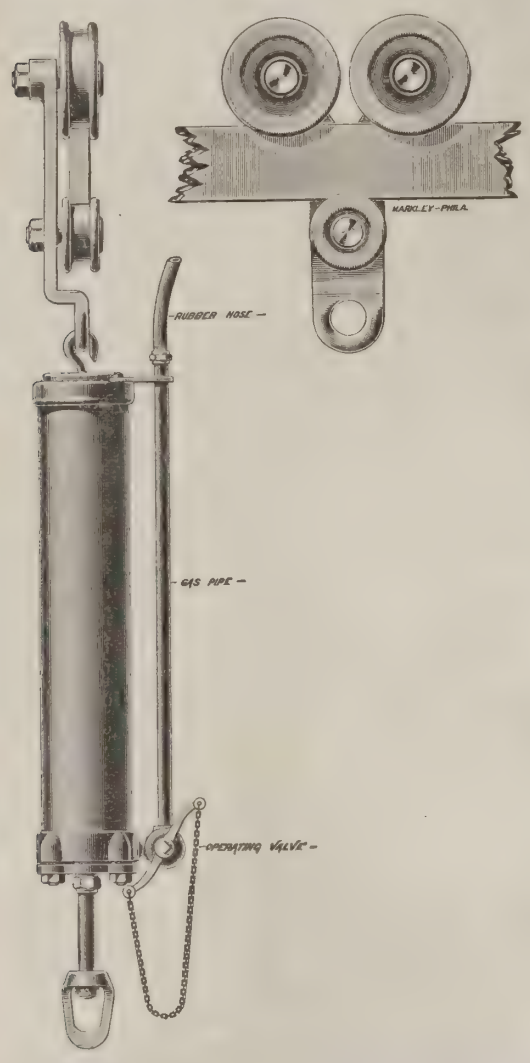
The man scrutinized him closely, took in his florid countenance, shook his head dubiously and replied:

"Well, that is hard to say. Some take a good deal longer than others to get cured, but judging from your appearance I should say that they would keep you here three weeks at the very least."

Pedrick & Ayer's Pneumatic Lift.

The advantage of devices for lifting comparatively light loads was indicated in the design and introduction of the chain hoist, which has been so extensively used in the last few years for general shop purposes. The demand for ready appliances for quickly and easily handling pieces of work, up to one or two tons in weight, has become large. It has arisen from the saving in labor and the increased output that can be obtained from machine tools when the lift is used for such purposes.

While the chain hoist enables a person to lift the load quite easily, it must be remembered that it is done at the expense of speed, and they require the same expenditure of actual work as does the ordinary block-and-fall, so that in this respect the chain hoists are no saving in manual labor



over the old methods. For instance, to lift 1,000 pounds 4 feet requires an expenditure of 4,000 foot-pounds of work, and is of the same value, whatever time may be consumed in accomplishing it. In other words, with chain hoists the load is lifted by a light force, but requires a long time to accomplish it, while the ordinary block-and-fall requires greater force to operate it, while the load is lifted more rapidly. The frictional resistance in both the chain and the block-and-fall methods forms a large percentage of the work necessary to accomplish the lifting.

The pneumatic lift illustrated in the annexed engraving is made by Pedrick & Ayer, of Philadelphia. The design of the tool can be readily understood from the cut. Its advantages for lifting work into tools, where saving of time is a consideration, will be readily appreciated.

The production of the flat steel wire that furnishes the power for self-acting shade rollers is a very important manufacture, requiring technical skill of a high order in the various departments that the rod has to pass through, from its rough rolled state to the large coils of flat, highly tempered steel ready for the spring winding machines. The large rods are first subject to an intense heat in the muffler, thence to the acid baths, coating troughs and water treatment, after which to the highly heated bakers. This treatment prepares the rod for the powerful drawing frames, where the size is gradually reduced by being drawn through dies. When the diameter is small enough, the wire is passed through rolling machines to flatten, then to the tempering department, where the finishing occurs. A high grade of steel is the first necessity, and if it receives the best treatment then a spring can be formed from the product that will be satisfactory. Mr. Stewart Hartshorn was the first to use steel wire in shade rollers. He at first, as his father did before him, used brass wire. The unsatisfactory nature of brass springs prompted him to make long and persistent endeavors to get wire drawers to produce correctly tempered steel wire in large coils from which springs could be wound. At last fair success was met with, and the use of brass was discontinued. Many improvements have been made since the first steel spring was used in shade rollers. With the wish to still further improve, Mr. Stewart Hartshorn has lately built in East Newark, adjoining his Eastern shade roller factory, the most complete wire plant with the latest machinery, most of which is of novel and original construction, to produce the best steel wire possible for his shade rollers.

The Ewald Iron Company, of St. Louis, Mo., manufacturers of the old and well known brand of Tennessee Bloom Stay Bolt Iron, are placing this iron in more of the Eastern railroads and locomotive shops than formerly. It is rapidly growing in favor, and meets with approval wherever used.

The Sewel coupler, the latest form and construction of which is herewith illustrated, is now used by 88 railroads, having a mileage of over 43,000 miles, and on over 8,000 passenger cars.

The passage of steam is practically straight and unobstructed. Condensation is provided against by insulating the hose nipple by a dead air space completely surrounding it within the coupler head. All metallic parts are made of malleable iron, wrought iron or steel. The locking projec-

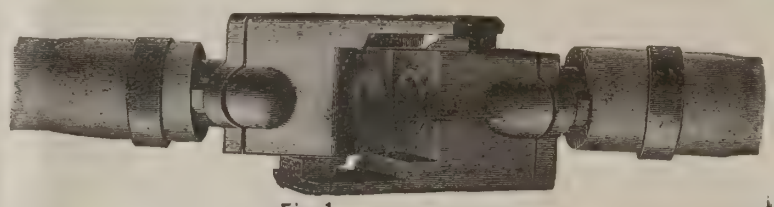


Fig. 1.

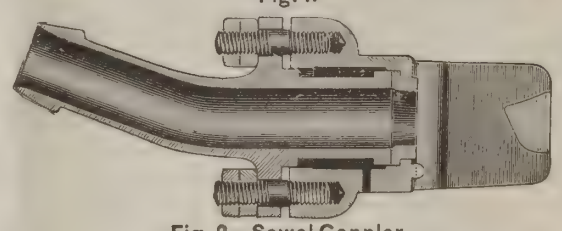


Fig. 2.—Sewel Coupler.

tions are constructed so as to draw the gaskets together in a direct line after contact. The gaskets are of peculiarly treated rubber and are of sufficient elasticity and strength to form a durable steam joint. The operation of coupling is simply a short downward movement, and it automatically uncouples in a reverse direction when the cars separate.

Electric Freight Locomotive.

The Thomson-Houston Works, at Lynn, Mass., have built an electric locomotive for the Whitin Manufacturing Company, of Whitinsville, Mass. The weight of the locomotive is 43,000 pounds, and it is carried upon four 42-inch steel tired wheels. This weight enables it to exert a tractive power sufficient to pull a train of 6 or 8 heavily loaded freight cars on a level track. The motor and all the machinery are placed below the floor and between the wheels, and is covered by a platform, one end of which is railed in and roofed over for the protection of the operator. The wheel base is 6 feet 4 inches, and the gauge is 4 feet 8½ inches. The platform is 4 feet 4 inches above the rail. The locomotive is equipped with a band brake on the intermediate shaft between the armature and axle, double acting sand boxes, regular drawheads, and is in every way fitted to handle ordinary freight cars. The current will be obtained from a trolley wire.

The company for which the locomotive was built have heretofore employed 18 horses for moving freight cars about their establishment, and it is intended to dispense with these and the men who attend them.

Locomotive Tools.

The tools for which enginemen on the Panhandle are held responsible are: One broom, one chimney (extra for headlight), 4 flags (green), 1 coal pick, 2 chisels (flat), 1 firehook, 1 flag (red), 2 flags (white), 1 medical box, 1 padlock, 1 scraper, 1 sponging iron, 1 tank bucket, 1 wrench (airbrake), 1 wrench (alligator), 1 wrench (eccentric set screw), 2 crosshead blocks, 1 hammer (soft), 1 hammer (hard), 1 packing hook, 1 push pole, 1 shovel, 1 tallow pot, 2 tin torches, 1 wrench rod set screw (two ended), 1 wrench (monkey, 12-inch), 1 wrench (oil cup), 1 chisel bar (30-inch), 1 valve steam clamp, 1 wrench (monkey, 15-inch).

This list has got into print, and some papers express surprise at the long list of tools. If they had the opportunity of making an inventory of the tools in the boxes of some locomotives, they would think that the above list was a very small one.

Wm. Hazelton, 3d. has been appointed agent for the Short Electric Railway Co. system; his office is in the Penn Mutual Building on Chestnut Street, Philadelphia, Pa.

The Norton Jack Co., of Boston, Mass., is making a new 35-ton ball-bearing jack which is now ready to be placed upon the market. They will soon have a new track jack with several new features that will make it a good one.

Messrs. Vale and Young, of Baltimore, Md., have supplied the Pensylvania Steel Co., at Sparrows Point, Md., with 25,000 feet of sky lights. They are also furnishing all the sky lights for the new building of the Library of Congress at Washington, D. C., and a number of other buildings.

The Terracute Machine Co., of Bridgeton, N. J., have recently furnished the Pensylvania Steel Co. with four of their new design punching presses that punch two holes at the same time; they are also building a number of tools of special design for the Edison Electric Co., at Schenectady, N. Y.

Mr. Arthur M. Pierce makes the following announcement: The Dayton Manufacturing Company having made full settlement and purchased licenses are now authorized to manufacture and sell "Classification," "Tail," or "Marker" lamps, commonly known as "Blizzard," "Tornado" and "Utility" locomotive and train signal lamps, under nine letters patent to Messrs. Huntington, Johnson, Armour, Gaul and Madden. The above named company, together with the firms named in my circular letter of June 22, 1891, are the only parties having rights to operate under the said patents, and I am instructed as trustee to promptly and vigorously prosecute all infringers thereof.

Mates of the Royal Blues.

The handsome passenger coaches built by the Pullman company for the B. & O. "Southwestern limited," to run between Baltimore, Washington, Cincinnati and St. Louis, were inspected at Camden station yesterday. General Passenger Agent Charles O. Scull and Division Passenger Agent B. F. Bond explained the many features of the new equipment. The consignment consists of 15 cars. They were built after designs furnished by Master Car Builder Grieves, of the B. & O. The new equipment will supersede that now in service on the afternoon express from Baltimore. The full complement of each train will be one United States postal car, one baggage car, two passenger coaches and two Pullman sleeping cars. While the train will make up in Baltimore, it will in reality be merely an extension of the Royal Blue Line express to and from New York and the Southwest. A schedule will be arranged for the train, by which the time between New York and Cincinnati will be quickened two hours.

The coaches themselves are models of the car builder's art, the entire train being vestibuled, including postal and baggage cars, and fitted with Pullman's latest anti-telescoping device. The standard Pullman color, an olive brown, is used. If the cars were blue they would in every sense be Royal Blues, for they are built upon the same model and look just as pretty, staunch and shapely. There is the familiar coat of arms which decorates the Royal Blues, except that the Maryland insignia only appears. The interior bears even more striking resemblance, the upholstery being in old gold velvet plush and the woodwork being of mahogany. The only notable departure from the interior design of the Royal Blues is the absence of the smoking compartments, which are rendered unnecessary by reason of the fact that the forward coach of each train is assigned to smokers. Each car has separate toilet rooms for ladies and gentlemen, and a lavatory. A porter, in addition to the one in the Pullman sleeper, will accompany each train.

One of the most striking improvements is the substitution of easy sliding damask curtains for the tight-fitting slatted wooden blinds, which are the accompaniment of a double window, the upper section being of frosted glass. For each window there are also dust screens and dust deflectors, which provide a delightful draught of fresh air free from dust. The cars are heated by steam drawn from the locomotive, and are also provided with Baker's patent heater, for use in case the car should be detached from the locomotive, or in case the supply of steam from the engine should for any reason fail.

The Pittsburgh Forge & Iron Company, of Pittsburgh, Pa., are very busy in all departments. They have recently added a large quantity of new machinery, and will give more attention to general forgings than formerly.

Our Directory.

Chicago & Eastern Illinois.—Chas. H. Rockwell has been appointed general superintendent of this road, with office at Chicago, Ill. Mr. Frank Bruce has resigned as general master mechanic.

Cleveland, Cincinnati, Chicago & St. Louis.—A. G. Wells, superintendent of Indianapolis division, has been appointed superintendent of the St. Louis division, vice J. O. Van Winkle, resigned.

Columbus, Hocking Valley & Toledo.—S. S. Stiffey has been appointed master mechanic, vice W. H. Miller, resigned. M. S. Connors has been appointed superintendent of Hocking division, vice M. Stillwell, resigned.

Denver & Rio Grande.—J. J. Burns has been appointed superintendent first division, vice W. A. Deuel, resigned.

Florida Central & Peninsular.—E. Burton has been appointed master mechanic, vice M. J. Rogers, resigned.

Monterey & Mexican Gulf.—C. A. Merriam has been appointed general superintendent of the operated lines of this company, vice John Grace, resigned, with headquarters at Monterey.

Ohio & Mississippi.—Geo. W. Stevens, purchasing agent, has tendered his resignation to take effect Jan. 1, 1892.

Peoria & Pekin Union.—C. E. Schaff succeeds M. Mounts as general superintendent, with headquarters at Peoria, Ill.

St. Paul & Duluth.—George F. Copeland, superintendent, has resigned.

South Carolina.—J. H. Agnew, superintendent, has resigned.

Terminal Railroad Association.—J. O. Van Winkle has been appointed superintendent.

Texarkana & Ft. Smith.—W. A. Williams has been appointed general superintendent, vice J. G. Burke, resigned.

Wanted.

A boilermaker who has had 20 years experience as a foreman, wishes to find a position as such. Will furnish good references. Address, John T. Sweeney, No. 322 Wade St., Cincinnati, Ohio.

WANTED.—A brass molder of 22 years' experience, 17 years on locomotive work, desires a position. Has been 12 years in charge of foundry. Address John E. Stanton, 7321 Second street, E. E., Pittsburgh, Pa.

A graduated mechanical engineer and draughtsman of twenty years experience in railroad work as machinist, locomotive engineer, shop foreman and master mechanic, is open to an engagement. Have had experience as traveling salesman in railroad specialties. No. 1 references. Address, Mech. Engr., this office.

A Painter with 13 years practical experience, who has a thorough knowledge of passenger, sleeping and street car work, is posted on piece work prices, and familiar with the best methods of doing quick and durable work, desires situation as foreman; has had charge of shops, and will furnish references. Address H. B. P., care of NATIONAL CAR AND LOCOMOTIVE BUILDER.

NATIONAL CAR AND LOCOMOTIVE BUILDER

FEBRUARY, 1892.

CONTENTS.

The Louisville & Nashville is reported to be in the market for 1,000 box cars.

The Columbus Southern Railroad contemplates the erection of new shops at Columbus, Ga.

The Pullman Car Company is building 120 passenger cars for the Chicago & Northwestern.

The St. Charles Car Works are building 100 box cars for the Pacific Short Line, and have just completed 100 box cars for the Big Four.

A fine lithograph has been sent to this office giving a bird'seye view of the buildings, as they are to be, of the Columbian Exposition.

The New York Air Brake Company has closed a contract with the Lehigh Valley for brake equipment for 2,000 box cars recently ordered by that railroad.

The Empire State Express from New York to Buffalo, the running time of which is 52 miles an hour between stations, made up 33 minutes lost time recently.

The Northern Pacific opened new shops at Edison, Wash., Jan. 1. All the new machinery and tools were furnished by Messrs. Manning, Maxwell & Moore.

A contract has been awarded by the Norfolk & Western to J. P. Pettyjohn & Co., of Lynchburg, Va., for the construction of machine shops at Lambert's Point, Va.

A locomotive of the Debardeleben Coal and Iron Company exploded eight miles south of Birmingham, Ala., recently, instantly killing the engineer and fireman.

The United States and Brazil Mail S. S. Company have offered to the Brazillian Government free transportation of exhibits from that country to the World's Fair at Chicago.

The Kansas, Arkansas & New Orleans Railroad has filed at Little Rock a mortgage for $6,000,000, which money is to be used in the construction of the line through the State of Arkansas.

The project to build a new railroad between Baltimore and Cumberland has taken definite shape, an organization has been effected and a charter granted to the Baltimore and Cumberland Railroad Company.

A vote of thanks has been prepared by the directors of the World's Fair to be sent to Mr. James Dredge, editor of *Engineeeing* (London), in recognition of his services in furthering the interests of the World's Fair.

Colombia will celebrate its independence by a National Exposition at Bogota, to be opened on July 20, 1892. The exposition will remain open three months, after which the exhibits will be packed and shipped to Chicago for the World's Fair.

It is reported that the Old Colony and the Boston & Maine have taken out policies in the American Casualty Insurance and Security Company, of Baltimore, insuring the roads against all liability for personal injuries either to employés or the public.

The Prussian state railways have ordered some Janney couplers of the McConway & Torley Company. The couplers are for experiment. It is to be hoped that this may be a starting point for the spread of American ideas among the effete monarchies.

A passenger train on the Chicago, Rock Island & Pacific was ditched Jan. 23 near Chicago, and a number of passengers hurt. The train at once took fire from the stoves, and but for the prompt work of the uninjured several persons would have been burned to death.

The United States Supreme Court has sustained the South Carolina Court's decision affirming the validity of the law providing that the expenses of the State Railroad Commission shall be borne by the roads in the State, the roads being taxed on the basis of mileage.

The Florida Car Manufacturing Company, of Green Cove Springs, Fla., with a capital stock of $150,000, has been incorporated by Jas. G. Blaine and M. C. Blaine and Alba A. Silben. This company will establish car works for the manufacture of freight and passenger cars.

The Central Railroad Company of New Jersey has given orders to the Rogers Locomotive Works of Paterson for the building of 10 heavy freight engines, and to the Baldwin Locomotive Works of Philadelphia for two compound locomotives, one for passengers and one for freight service.

Articles of incorporation were filed recently in Springfield, Ill., of the Chicago & St. Louis Electric Railroad Company. The company proposes to construct and operate an electric railroad from Chicago to St. Louis. The principal office will be in East St. Louis. The capital stock is $1,000,000.

The Chicago, Rock Island & Pacific has placed an order for 1,200 freight cars, 500 of which are box cars, to be built from the company's designs; also 500 furniture cars and 200 stock cars. Of these 700 were awarded to the Wells & French Car Company, of Chicago, and the balance to the Peninsula Car Company, of Detroit.

The Pennsylvania company has a floating equipment of over 200 craft. They include ferryboats, lighters, barges, car floats, canal boats, flat scows, ice breakers, dredges and schooners. The horse power of the steam floating equipment of this company at New York City equals the horse power of the locomotives on the New York division.

The keel of what is said to be the largest steamer on fresh water in the world has recently been laid by the Chicago Shipbuilding Company of South Chicago. Her dimensions will be 330 feet keel, 350 feet over all, 45 feet beam, and 24½ feet depth of hold. On the ordinary stage of water in lake channels she will carry over 4,000 tons.

According to the *Engineering News*, of the 171,044 miles of railway now completed in the United States 42,663 miles, or 33 per cent., have been built since the end of 1885. Placing the cost of this work at the low figure of $30,000 per mile, these figures indicate the expenditure of $1,280,000,000 in railway construction during the past six years.

The St. Charles Car Company have under construction 10 first-class cabooses for the Wabash Railroad; four circus coaches for Ringling Bros.; four coaches for the Des Moines & Northwestern Railroad, and are still at work on the C., B. & Q. and Santa Fe box cars. They are also building 10 elegant coaches for the Burlington & Missouri River Railroad.

A bed of coal, of excellent quality for steaming purposes, has been discovered on the shores of Shagnet Bay, in the Straits of Magellan. The importance of the discovery to the commerce of the world is very great, considering that all steamers passing through the Straits are required to coal there, the supply for which has heretofore been brought from England.

The New York Central Railroad and the Wagner Palace Car Company have scored another great success by the tour of the International League of Press Clubs, in a complete vestibuled train of Wagner palace cars from New York to San Francisco and return. The press and public of the Pacific coast pronounce this the finest train ever seen west of the Sierra Nevada Mountains.

One of the many uses to which aluminum has been adapted is in taking the place of gold leaf for ornamental work. Mr. Wm. Swanson, division master mechanic of the Pan Handle shops at Indianapolis, has recently used this metal in the lettering of two locomotives and tenders. They present a very neat appearance, and the cost in material and labor is about $12 per engine in favor of the aluminum.

A remarkable feature of locomotive building last year was the number of compound locomotives constructed. The Baldwin Works have up to this time built 101 compound locomotives, the Schenectady Works 13, Rhode Island Works 12, Brooks Works 1, the Chicago, Burlington and Quincy 1, the Old Colony 1 and the Lehigh Valley 1. All the other locomotive works of any standing are preparing plans for compound locomotives.

Engineer E. A. Bliven, of the Southern Pacific, was recently relieved from duty on the road on account of deafness, and employed as stationary engineer at Wadsworth shops. The point in Mr. Bliven's case that is of interest is that the malady that finally ended his usefulness as a locomotive engineer was brought on by shrill whistles. He liked his whistle to make lots of noise, and generally fixed those that came under his care so that they were the terror of the country through which he ran.

About 1,100 Pennsylvania Railroad employés, including conductors, baggage masters and brakemen, are elated over a generous advance in wages conceded by the company. A notice is posted at their headquarters to the effect that, dating from January 1st, 1892, the increase, as follows, will go into effect: Conductors, from $3.25 to $3.50 per day; baggage masters (local), from $1.75 to $1.90; baggage masters (through), from $1.90 to $2.10; brakemen, from $1.65 to $1.80. The increase averages about 10 per cent.

The Chicago North Side street car officials have begun war on tobacco chewers who persist in annoying women who patronize the road. Recently each car had these placards, placed above the windows:

Please do not chew tobacco. Query: Is a man who does, and spits on the floor, neater than a pig?

You don't wear dresses. Do you? If you did you would not spit on the floor as a matter of self-protection. Cleanliness is next to godliness, they say. We can't be gods, but we can be clean. Do not spit on the floor.

The signs have resulted in a decided abatement of the nuisance.

The Old Colony Railroad, of Massachusetts, has in its possession the body of an old passenger coach built in the early days of railroading. It was modeled after the stage coaches of those days, and carried on a four-wheel truck to which the draught appliances were attached. Mr. John Lightner, for many years master car-builder of the Boston & Providence Railroad, who designed and built these cars, is still alive. Mr. J. N. Lauder, the superintendent of rolling stock of the Old Colony, has arranged with Mr. Lightner to rebuild this coach for exhibition at the World's Fair. The same road has also some old style inside-connected locomotives, one of which it will perhaps exhibit.

At the recent opening of the St. Clair tunnel Sir John Ross alluded to the tunnel as a sign of perpetual friendship and "unrestricted reciprocity," adding that "commercial connections between the two countries would lead to peace and unity."

Secretary of State William H. Seward once remarked in conversation that the adoption of a uniform gauge of railways in this country would do more to restore and cement the Union than would all the Reconstruction legislation then pending or suggested; and he embodied the idea in one of the last of his state papers, in which he urged, not only a uniform railway guage, but the bridging of the rivers of the country at every point of vantage, and describing all means of intercourse and commerce as bonds of the Union.

After considerable negotiation the World's Fair Directors have secured a southern entrance to the grounds for all the railroads centering in Chicago. Twenty-seven acres adjoining Jackson Park, from Sixty-third to Sixty-fifth street, have been leased, and a right of way is secured from Sixty-fifth street to the Baltimore & Ohio Railway track at Seventy-fourth street. The Baltimore & Ohio agrees to allow all roads to use its tracks on payment of the usual trackage charge. The completion of this right of way is of great significance to the directors, because it breaks the monopoly of World's Fair traffic the Illinois Central would enjoy; it gives a direct entrance to eastern roads and will enable the lines from the south, west and northwest to land passengers and freight in the Exposition grounds, using the Belt Line and Baltimore & Ohio tracks.

A committee of the Polytechnic Institution, Regent street, London, have made arrangements with the Inman Steamship Company for excursion trips to the Columbian Exposition in 1893, specially intended for working men and others whose means will not permit of visiting the United States under ordinary circumstances. By the arrangements made those who participate in these excursions will travel by the fastest vessels afloat. Parties will leave Liverpool weekly during the months of June, July, and early part of August, by the magnificent steamers of the Inman Line, and, traveling by these fast vessels, the whole tour will be able to be accomplished within one month. The proposed arrangements are that two days shall be spent in New York; a visit to Philadelphia and Washington will also be made, proceeding from thence to Chicago, where each party will be located for six or seven days; the return journey will be continued through Buffalo to Niagara, visiting the falls, the journey back to New York being taken down the Hudson River. The committee hope that the whole round excursion, including accommodation for the period, will not exceed $125, which is only slightly above the fare for the ocean journey alone during the season by the above steamers.

English Comment on the New York Central Fast Run.

The *Railway Engineer*, commenting on the fast run made on the New York Central and Hudson River Railway on the 14th of September, and described in the October issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, says:

"This was a wonderful performance, but we quite fail to see wherein it proves, as some of our American contemporaries would have us believe, the superiority either of the design or the workmanship of American engines. The train weighed (3 cars) 259,600 pounds, engine and tender 200,000, say 206.9 tons; but the New York Central is flatter than any English line of the same length. How long engines will stand up to this kind of work yet remains to be seen, and it is most disappointing to note that no record of the fuel and water consumed has been published, because, after all, the coal and water consumption and maintenance are the three main points to be considered.

"This run, as a run, is undoubtedly unparalleled, and its net result has been the establishment of the "Empire State Express," which leaves New York daily at 9 A. M., and arrives at Buffalo at 5:24 P. M., or, in other words, runs 440 miles in 504 minutes, equal to an average speed of 52⅜ miles per hour. The intermediate stops are at Albany, Utica, Syracuse and Rochester. This train constitutes a very fine service, but, it is a very different performance to the experimental run.

"We have in this country lots of trains timed at above 52⅜ miles per hour, but we have not the length of run, which, by the way, eases the matter considerably.

"It may not be out of place to refer to some fast running which has been done in this country.

"As far back as May 11, 1848, the Great Western broad gauge engine "Great Britain" ran from Paddington to Didcot, 53¼ miles, in 47 minutes [68 miles per hour]. The train consisted of four coaches and a van. The late Sir Daniel Gooch stated that the run from Didcot to Paddington was frequently run with a train of seven or eight broad gauge coaches in 47 or 48 minutes with engines of the "Great Britain" class, and that the fastest speed he ever could get was 75 miles an hour down a gradient of 8 feet to the mile, and on this occasion Mr. Trevethick, of the L. & N. W. Railway, was on the foot-plate with him.

"On 31st of July, 1880, a special, taking the Lord Mayor to attend a banquet at Scarborough, ran from King's Cross to York, 188¼ miles, in 217½ minutes (including 10½ minutes' stoppage), equal to 52 miles per hour.

"For short distance runs the following is one of the fastest on record. It was with a special, on the occasion when Mr. R. Martin (then Locomotive Engineer of New Zealand railways) was inspecting the railways of this country. The distance from Little Bytham to Tollington is 12 miles 29 chains, and it was run in 5 minutes 46 seconds, or at a speed of 77.15 miles per hour.

"Another of the fastest runs ever made was in 1888, when the Berwick line was blocked with snow and the East Coast mails were sent *via* Carlisle. The run from Carlisle to Newcastle, 61 miles, was performed in 53 minutes, or an average speed of 69.58 miles per hour."

We are pleased to give space to the record of fast running in Great Britain. In the instances cited we notice, however, that the weights of the trains are omitted. Fast runs with light trains for short distances are common enough. One of the New York Central officers recently remarked: "The last run I ever made with Mr. Vanderbilt was coming from Buffalo; we made the run from Buffalo, Exchange street station, to Rochester, 69 miles, in 58 minutes, continuing until we reached Lyons, 101 miles, in 84 minutes; 72½ miles per hour."

The weight of the "Empire State Express" is as follows:

Engine and tender	200,000 lbs.
Buffet car	79,000 "
Drawing-room car	94,950 "
Two coaches	120,000 "
Total weight	493,950 lbs.

Fifty-two miles per hour for 440 miles daily with this weight of train is good running, but there is no indication that even this is the limit of speed to be attained with ease and safety. Recently 33 minutes lost time was made up on this run.

As to "the superiority either of the design or workmanship of American engines" we prefer to let the Railway Commissioners of New South Wales answer. Speaking recently of the comparative merits of the American locomotives running there along with English engines, they said of the American engines: "These locomotives have been doing 65 per cent. more work than any we have on the system."

Burning Off Cars.

BY CHARLES E. COPP, IN THE *Painters' Magazine.*

About once in ten years the paint upon the exterior of passenger cars will need to be removed by some process down to the wood, from whence we must start to build up again to a finished surface and to an enduring state. The time a car will run before burning off depends, of course, upon how durably it was painted in the first place. Contract shops are the places for hurried work, and we have known work turned out from such shops to require burning off in five years. Work done at the home shops of a railroad it is not an unusual thing to have run 13 to 15 years, if the car escapes serious accidents, so as to avoid a general repairing

Of all methods of removing paint from woodwork, we know of nothing practical, and even allowable, except flame, either from gas or naphtha; and of these two gas is to be preferred on account of its safety from the explosions which most torches are subject to from the careless use and handling which they are most sure to get from the average workman who uses them, and also from the danger of fire and damage to property. And gas has a steady pressure, and is always ready to use, without the constant filling and trimming that a torch must receive; consequently the work is greatly expedited; enough, we should think, to nearly pay the difference in cost of gas over naphtha, and more than enough if life, limb and the pursuit of happiness has anything to do with it, to say nothing of saving property. The gas supply should be plentiful, in good sized pipes and hose to insure a good pressure; but if the pressure is not sufficient an artificial force can be obtained by tapping the pipes from the air brake tester, which most railway shops contain nowadays, running the pipes alongside the gas pipes and using a parallel hose with an outlet just behind the gas outlet in your burner, which burner should be a double affair like a fork, with stopcocks for both gas and air, so that the pressure from each may be regulated at the will of the operator. If no air brake tester is in use in a shop, a small pressure blower may be set up on a beam somewhere, with a belt from a shaft to propel it, from which pipes are to run as in the other instance. It is best to have air pressure of some sort, as there will be a large saving in gas with a hotter flame—a blue flame instead of a white or yellow one. Where there are water-works a water motor pressure can be easily rigged. But the Westinghouse air brake pump and tester, which is a duplicate of that on the train, and is in use in most shops, is the most practical and economical, as little or no extra outlay or expense is necessary.

With the burning, or rather blistering, means settled upon, the next is the proper tools and methods for removing the blistered paint and varnish. In many shops a man takes the gas hose in one hand and a putty knife or chisel in the other, and by following up the flame in his left hand with the tool in the right—by shoving up under the paint—great speed is attained and the work soon and cheaply done. But that, to our mind, is not a satisfactory way of doing this important work. We believe in removing more than the old varnish and outer coats of paint; the whole of the paint, priming and all, should come off, and this cannot be properly done with one hand shoving a tool up over it. A hoe-scraper of steel should be used with both hands by one man pulling down and the flame held by another, if it does cost a little more. This method is more humane to man and better for the work. It is important that the old priming should come off, as heating it injures it, and if left on it stops the suction of the wood upon the new paint to follow and therefore is detrimental to its adhesiveness and durability. Besides, old cracks go through the priming to the wood, and if left on will soon reappear through the new paint. And as this old lead priming comes off hard, it will require the united strength of a man's two hands in most instances. However, many burn the paint too much to scrape easily—*they burn it on*; it should only be well blistered and then removed quickly before getting cold again.

To get ahead fast, a larger flame should be used upon the panels, blistering a larger area than will be required around the windows. All straight moldings should be ripped off a car by the carpenters before burning, as that was long ago settled as the best method by leading roads. The cinders and dirt so get behind a molding, however firmly put on when the car was new, or formerly burnt off, as to force it off in such a manner that it lets the water in, looks bad, and can not be brought back by renailing, and they need on that account to come off as a car needs burning off; besides, it does not pay to burn them off; new ones can be put on about as cheaply as the old can be scraped and sandpapered, besides being infinitely smoother, if the result is anything to be cared for. Usually the first time a car is burnt off the deck or "monitor" or "turret," as you may term it, as well as the underneath of the "visors" that cover the platform, may be omitted and painted over the old paint. This saves expense and a troublesome job, and gives as good if not better results. But the second or third burning will probably need to be made a clean sweep of the whole car.

When burning off is completed, and the work has received a thorough sandpapering, and the carpenters have got the moldings on, other repairs done—new panels, if there are any badly cracked ones put in, and joints and other smoothing up done—the car is ready for the priming, which should be done with rather less oil than for new work, as the suction is not so great.

Steam Hammers.*

The direct acting steam hammer was proposed by the late Mr. Nasmyth to enable him to forge the large shafts called for by steamship builders when steam was in its infancy as applied to navigation.

The time has now come for something more powerful than the largest steam hammer that has now been built. The great hammer of Creuzot, 100 tons in falling weight, with a stroke of 16 feet, is not enough to make some forgings that are now called for.

It is well known that a very heavy hammer of short stroke will make better forgings of a given size than a lighter hammer falling a greater distance, even if the calculated dynamical efficiency of the blow is the same in both cases. The weight of the hammer bar, or tup, should be at least eighty times the square of the diameter of the shaft in inches, 50-inch diameter calling for 200,000 pounds weight of hammer. The knowledge of this principle has led to the construction of the forging presses that now bid fair to take the place of the direct acting steam hammer. This introduction of the forging press to do work usually accomplished by the steam hammer marks an era in mechanics.

Of my own knowledge I can speak to you of methods that have obtained in forging over a period of 50 years, from when forgings were required for machine shops that had not yet a single planing machine, and from the early tilt hammer, with its wooden helve, the rude trip hammer, through all the changes in direct acting hammers, both steam and geared, down to this last extension of the forging press.

The many well constructed power hammers that have come to be essential in every forge that has to do with sizes beyond the power of one or two men to work on their anvil, has done away with a method common enough not many years ago, when anchors and such forgings were smithed by hand power only. Then the master smith, striking with his hand hammer, to do little more than indicate the point to be struck by the helpers, directed from six to eight men who, each swinging sledges of the heaviest weight, stood in a circle about the anvil, and striking, one after the other in rhythmical cadence, poured a succession of blows. Each man swinging his sledge to give, say 12 blows per minute, or one blow each five seconds, could so time their strokes when six men were in the circle as to give 72 blows per minute or more. For this character of work, when occasionally required, the extra men would be called from the other fires to work off the heat.

It is only by careful study of the purpose to which a steam hammer is to be applied that a knowledge of the guiding principles can be learned.

Bar steel is hammered from the billet to strikes light or heavy at the same speed of stroke, if possible. Steel is drawn out to nearly the required size while still at a good heat; the hammer must then go on with diminished heat in the bar until it ends at a certain low heat known to good hammermen. This puts the finish on the bar and insures the best qualities that can be produced by "work." Steel, as it is cast in the ingot, is coarse grained, and in no way like the fine grain shown in the fracture of the best tool steels. This difference in structure is brought about by means of "work." This work may be done by rollers, it may be done by hammers, it may be accomplished by squeezers, the temperature of the metal being an important factor; it may be in a manner accomplished by repeated heating to a red heat and sudden cooling.

It was from a knowledge of this required work that I was led to propose, in the case of a direct self-acting steam hammer, to introduce a throttling valve in the exhaust from below the piston, while the exhaust from above the piston was left free. This simple contrivance enables a quick stroke hammer to give light or heavy blows with the same number of strokes per minute. With the lower exhaust open, the full intensity of blow is obtained; a hammer so running will be able not only to keep the bar up to heat continually, but even with reduction of size of bar to seemingly increase the heat. By choking the escape of the lower exhaust port the hammer meets the elastic resistance of the steam that cannot escape, and the blow is made lighter to any required degree, while the number of blows per minute remains the same, as the up stroke of the piston has a free exhaust.

To illustrate the effect of rapid, heavy blows, in keeping up the heat of the steel, you can consider the action as very like what is shown as a feat of skill accomplished by a smith, who can, by rapid blows, heat a cold rail rod to such a degree as to light his pipe or his forge fire. In showing the action of a quick running, small steam hammer used in tilting tool steel, the hammer man, after drawing out a bar at a good heat, will quench or cool one end, and then, by rapid, heavy blows, that reduce the end to a small rod, reheat it at once to a bright red heat by concussion. This exhibition of what can be done teaches little to the astonished looker-on, but to the mechanical student it is an illustration of a physical fact that is worth remembering.

When a limited amount of work is required to shape steel that has already had work put on it, this work can be done to advantage by a squeezer. Thus, makers of steel hand and sledge hammers use a forging-press that is simple and very effective.

The machine for this purpose has a row of dies placed side by side on a bedplate of sufficient length; over this and parallel with it is a crosshead carrying similar dies. This crosshead, operated by pitmen from cranks or eccentrics driven by gearing from the pulley flywheel, has an amount of motion adapted to the work to be done. The steel bar to be wrought, heated to a moderate forging heat, has an oval hole punched through it by one pair of dies; then the hammer is formed by other dies so gauged and shaped as to result in the finished forging of a hammer being cut loose from the bar between the last dies of the row; the number of the dies required depending upon the shape of the required forging. Hammers, from the smallest size to a smith's sledge hammer are thus made, good in quality and low in cost.

The Rider forge is another kind of forging press; but it has a row of separate plungers with a short stroke, each operated by an eccentric. The eccentrics are set at 60 degrees between each. The motion is rapid, say about 600 strokes per minute, ⅝-inch stroke; a certain amount of elasticity being given to the lower dies by plungers packed with cork, the lower dies are adjustable by screws and gearing so as to be set up from time to time, thus enabling a very short stroke to cause considerable reduction of size. This press is a hammer as to rapidity, but a hammer of a fixed stroke.

The drop press is useful when a shape can be produced by a single blow. Each and all of these machines have their places, but their output requires consideration if we examine the quality of the work done by them.

* Abridged from lecture by Dr. Coleman Sellers.

Increase in Freight Car Building.

We take the following from the *Railroad Gazette* of January 15:

A year ago we reported 98,074 freight cars built by private works in 1890. Later figures brought the total up to 103,774 freight cars as the output of all works outside of railroad companies' shops. The returns received for 1891 now give 95,514 freight cars built by private works last year. From these figures the falling off appears to have been a little less that 8 per cent.; if full returns could be got this might be changed somewhat. The reports for each year are from 50 companies. Only 38 replied for both years, but the net decrease in the output of these 38 works is a trifle over 9 per cent. We are probably safe, therefore, in assuming that this represents fairly the relative work of the two years in building freight cars. The fluctuations in the business last year were unusual. Twenty-three of the firms which report in both years show a falling off of 34 per cent.; 10 of them show an increase of 45 per cent. Among these latter, naturally, the largest gains have been by firms which were just getting established in 1890, or which for some reason had reduced their output in that year much below the normal. The greatest decreases in 1891 were among some of the large works which are embarrassed, or, in one or two instances, works which, on account of the low prices prevailing, turned their plant to other products. The net increase in freight cars for several years has been, according to Poor's Manual, as follows:

1890	10,801	1886	40,395
1889	46,054	1885	7,129
1888	54,239	1884	19,736
1887	104,973	1883	48,212

Average for 8 years, 41,440.

The total freight cars in the United States at the end of 1890 was, by Poor, 1,061,970. It is quite impossible to make any close estimate of the number of those built in any one year which have gone to fill vacant numbers; but 1,100,000 is a convenient round number to remember and is probably not far from the total in service at the end of 1891.

A San Francisco paper, commenting upon the San Francisco & North Pacific Railway having been accused before the State Railway Commission of having charged $25 for carrying 80 tons of grapes, says: "Any one who would object to a freight rate on grapes that is equal to 1½ cents a hundred pounds ought to live along the Southern Pacific lines for awhile. The Southern Pacific charges about 10 cents a hundred pounds, just to look at the freight, to say nothing of carrying it."

A. Fire Door.
B. Door Casing.
C. Air Door.
D. Deflector.
F. Cam to Work Deflector.
G. Riding Bracket for Cam.
H. Door Latch.
J. Spring for Latch.
K. Spring for Air Door.
L. Furnace.

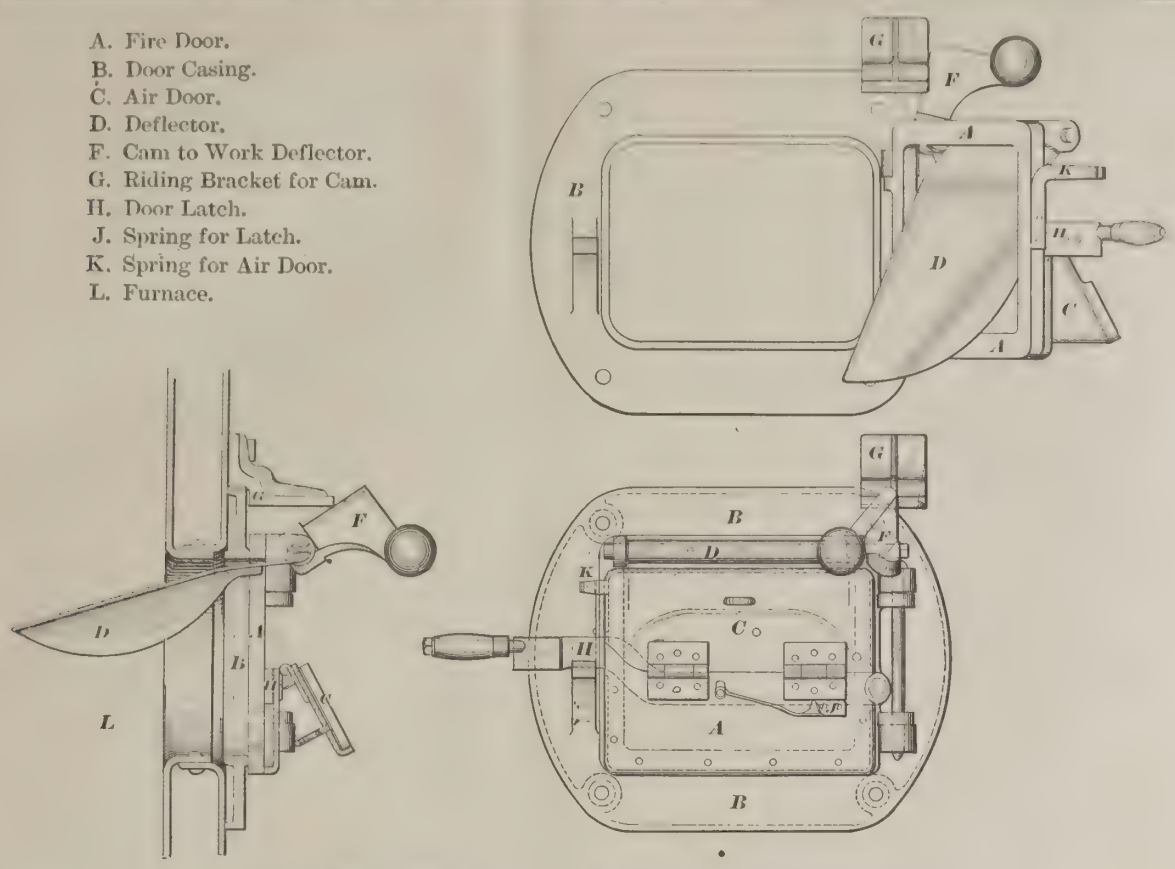


Fig. 1.—SOUTHERN PACIFIC STANDARD FIREBOX DOOR.

Southern Pacific Standard Firebox Door.

Coal costs the Southern Pacific Company $5.25 per ton on the average, and among many fuel-saving devices there employed that might profitably be used by some other roads is the firebox door and deflector shown in the accompanying illustration. Fig. 1 shows the standard door and deflector in general use on the company's engines. The deflector *D* can be raised or lowered by the cam *F*. The air door *C* can be easily opened or closed. With coal of highly volatile composition *C* is usually left open, as is shown in the view in lower left hand corner of Fig. 1. This is the normal position of the device while running. Firing is done through the air doorway *C*, and as it is left open the fireman is spared the work of having to open and close the door between each shovelful of coal.

At first sight it may appear that the volume of air allowed to be drawn in through the air doorway must be too great for the needs of the fire, and so it struck the writer when he first saw it. A hole big enough to fire through seemed too large, and the fireman seemed to be having things altogether too easy in not having to wrestle with his firedoor and shovel at the same time, as the writer had to do in his firing days. But the facts that the pointer stayed beautifully up to a "hundred and enough"; that the engineer and firemen both said the engine steamed better and burned less coal with the air-door left open, and that no smoke was emitted from the stack except a few transparent puffs when fresh coal was thrown on the fire, seemed to prove that there was none too much air admitted above the fire. This was abundantly verified by later experience. Fig. 2 illustrates a proposed improvement of the door and deflector shown in Fig. 1, only a few of which are yet in use. It is the design of Mr. F. L. Bates, an engineer on the road. This door costs less to construct than the standard door and has the advantage of a separate and independent deflector, so that the amount of its insertion into the firebox as well as angle of deflection can be varied.

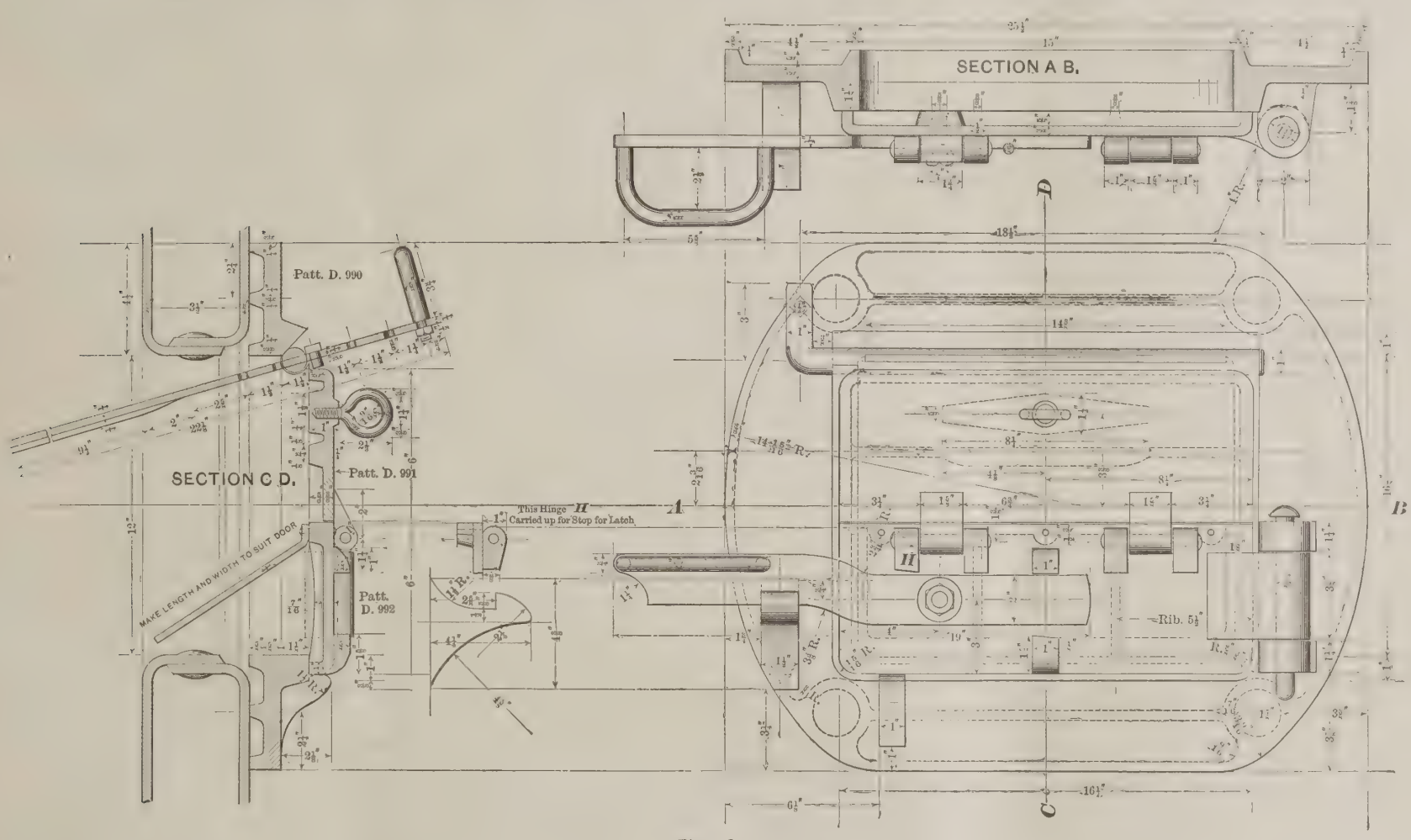


Fig. 2.

Following is given an analysis of three kinds of coal used on the Southern Pacific. With the two kinds highest in volatile matter, Carbon Hill and Rocky Mountain, these doors are very effective in preventing smoke and saving coal. With Union coal the door is not so effective in improving combustion, and the air door is usually left closed between fires.

	Carbon Hill. Per cent.	Rocky Mountain. Per cent.	Union. Per cent.
Moisture	2.16	2.1	1.45
Volatile matter	31.73	26.7	25.55
Fixed carbon	55.80	66.1	57.00
Ash	10.31	4.3	16.00
Sulphur (separate)	2.33	.8	1.008

"Suggestions" for Locomotive Improvement.

If there is any one subject which the average man thinks he is pretty well posted upon it is how to make a locomotive which will "run 60 miles an hour" and draw trains at that speed. Why not? So much cylinder, so much driving wheel, so much steam pressure, and the thing is done; all the rest, the details, proportions, and the small thingumbobs of greater or less degree, any one can put them in—they are not worth considering as items in the scheme. We say this because we hear men almost daily discussing this matter—not merely outsiders, but veterans in the business; men who get their bread to-day by running locomotives and by overseeing railway plants. These men, let us say, are by no means so confident as to what is the best way to build locomotives for high speed traffic, not nearly so arrogant in prediction of what they can do as some others who have not had a tithe of their experience. Considering their modesty in prophesying, we may look upon the suggestions of those who build locomotives by word of mouth with no great favor, for in most of them we see a want of actual experience which wholly unfits them to improve anything. One writer suggests that 40-ton locomotives be fitted with "22×18" cylinders and 56-inch wheels for express service, but, unfortunately, he does not think the boiler pressure worth mentioning.

So far as the locomotive of to-day is considered, it is the quintessence of the best mechanical practice all over the country; all over other countries also. The type of engine which is used here to-day has not been invented, but evolved piece by piece from the daily practice of railways. These last are moneyed corporations engaged in making one dollar into 110 cents, and it may be taken for granted that they spare no pains or expense to gain the ten cents. Every improvement that has any sort of promise of reducing expenses is adopted, and any invention that will improve the present locomotive so that it is capable of more work and higher efficiency is welcomed. This is the fact, although it is contrary to public opinion. The belief that railroad officers will not pay for improvements has gained circulation through the complaints of amateur inventors, people who operate railway signals by levers sticking up in the track and similar devices. There is no gainsaying that the present locomotive is capable of improvement in many ways, but it is a question what these improvements shall be. We contend that the answer to it can only come from railway men themselves, and that suggestions from others are generally valueless, for the reason that they do not fully understand all the conditions involved.—*Engineer.*

Interviewing an Engineer.

I thought from the general appearance of the man, and from the way he looked up every time the whistle sounded, that he was a railroad engineer, and when I made bold to ask the question I found I was right. After we had conversed for a few minutes on general topics, I asked:

"I suppose you have had your share of narrow escapes?"

"Yes, but not on the rails," he replied. "I was once shot at in a saloon, and I once fell off the roof of a church. I never had an accident on the road."

"Were you never flagged for a bridge carried away by a freshet just in time to prevent an awful calamity?"

"Never; bridges always all right."

"Ever almost crash into another train?"

"Never."

"But you've run over people?"

"Never did, sir. People always get out of my way."

"You have at least been very anxious when rushing through darkness with hundreds of lives in your keeping?"

"Yes—anxious to get home, I suppose, but I don't remember any particular instance."

I wasn't at all satisfied thus far, and, after pausing to take breath, I asked:

"Were you ever startled by thinking you saw an open switch when too late to stop the train?"

"No, sir; switches are always all O. K.," he replied.

"I have been told that some engines seem to be possessed by human intelligence?"

"Yes, I suppose so, but we don't use that kind on our road."

"Many brave men have died with their hand on the throttle."

"I presume so, but I don't want to die that way. I want to die at home in my bed."

I was determined to get something out of him for a sketch, and so I persisted:

"Did you never have your fireman go crazy while on a run?"

"Never."

"But you must have been prepared at some time or other to sacrifice your life to save your train?"

"No, sir; I never have. You don't seem to understand the business. I simply run to Chicago and back, and sometimes make as high as $110 per month. That's about all there is to it, and if you are after perilous adventures you should interview street car drivers. I understand that they take their lives in their hands every day in the year.'—*Detroit Free Press.*

The Bernardos System of Electric Welding.

In a recent issue of *Engineering* a very lucid description of the process of welding by electricity as carried out in a large manufacturing establishment is given, of which the following is an abstract:

The principle of the Benardos system of welding consists in the concentration of a great degree of heat upon a small area by means of the electric arc. It is well known that the temperature of the arc is the highest that can be prodnced artificially, exceeding that of any form of furnace. Hence it will be readily understood that not only will it raise a piece of iron to the welding point, but that it will also readily fuse it, and make it run just as if it were solder. It is not, however, feasible to form an arc of such dimensions as to embrace the whole of even a moderate sized forging. An area of 2 square inches is about as large as can be treated at once, without special appliances, and hence the making of a large weld by this system has to be done piecemeal. A portion of the two surfaces is first united, and then a second portion, and so on until the entire areas are welded together. Loss by wasting does not trouble the workman, because he can make it good by melting small pieces of iron or steel on to the work, thus actually increasing its dimensions, if desired, as he proceeds. With his work connected to one pole of the dynamo, either by a flexible lead or by lying on an iron bench in communication with the mains, and with a carbon joined to the other pole of the dynamo, and carried in a non-conducting handle, the smith can apply the arc just as he sees fit, either concentrating it on a spot the size of a penny, or moving it back ward and forward along a narrow line. In twelve seconds he can melt an inch hole through a $\frac{5}{8}$-inch boiler plate, and can then prolong this hole into a slot, cutting the plate into any shape he pleases. So intense is the heat that the operation can be conducted under water, and the iron fused while deeply immersed.

To the spectator the smith seems to be armed with a blowpipe. A blue flame shoots from the end of the carbon with an intensity that suggests the idea of a most powerful blast, and beats upon the work with the greatest violence, widening out just as if it were spread by the inertia of its particles. Three inches is the usual length of arc, but it can be readily drawn out to more than double this length. The brilliancy of the light produced is utterly dazzling, and cannot be encountered for a second without the protection of thick blue glasses. Through these the tongue of flame can be seen licking its way into the metal, which boils and bubbles under its action, until the instant when the man breaks the arc and seizes the hammer to consolidate the work. He has only a few seconds during which he can do this, for the comparatively cold metal around the glowing spot rapidly conducts the heat away. He then takes up the carbon and touches the work again. Instantaneously the flame is beating itself on the iron, tearing and biting its way into it, and in a few moments the refulgence of the arc is increased by that of the dancing globules on which it impinges. Step by step the entire length of the weld is passed through the arc, until the whole has been exposed to its searching influence.

If a thick object has to be united, like a broken shaft, it is necessary that the metal shall be fused right down to its center, and the cavity thus prepared gradually filled up by melting into it small cubes of iron. The process is carried step by step all round the circumference. In the making of fittings, such as elbows and tees, a less intense and prolonged heat is required. By the aid of the arc the man cuts the two pieces of metal to the required shape to fit accurately together, and then he not only fuses them together, but also lays in the angle of junction a nicely rounded fillet, which enormously increases the strength of the joint. It is worthy of note that a few months ago the men now employed in the electric shop were laborers, and therefore do not command the wages of more skilled artisans. For the welding of flanges to pipes a special machine has been constructed. Its general construction recalls that of a lathe. The tube, with the flange driven on, is set in rotation, and a carbon is arranged to play its arc on to the face of the flange. When the desired heat has been attained a roller is brought up and pressed against the work to consolidate the weld. This can afterward be strengthened by a fillet laid in its outer angle if desired.

After seeing an installation of this kind, and the splendid work it will turn out, the question "Does it pay?" naturally presents itself to one's mind. This is a matter that cannot be settled by mere inspection. Messrs. Lloyd, however, who were the pioneers in gas welding, and employ it very extensively, state that welding can be done with electricity at one-fourth the cost attending the use of gas. They ascribe a great part of this saving to the fact that the arc is extinguished except when in actual use, while the gas flame has to be kept in constant action whether the work is under it or not. They do not contemplate the substitution of the arc for the smith's fire for work that can be done in the latter. For plain work the smith can certainly excel the arc both for speed and cost. It is at the point where the ordinary smith has to confess himself beaten, and the most skilled members of the craft make numerous wasters, that the electric process begins to make its advantages felt. From this point it goes forward and successfully accomplishes jobs that without it are perfectly impossible. In Russia it is being extensively used for the manufacture of iron barrels of nearly 100 gallons capacity out of sheets little more than one-sixteenth inch thick.

Rapid Locomotive Erecting.

About four years ago one of the London & Northwestern standard six-coupled goods engines was erected at Crewe in 25½ working hours. A few months later an engine was erected at the Altoona shops of the Pennsylvania Railroad in 16 hours and 50 minutes. At Crewe the start was made with base frame plates lying flat without any attachments, while at Altoona the frames were erected with all their cross connections, and the cylinders were fixed.

In a recent issue of *Engineering* the erection of a locomotive in 9 hours and 47 minutes at the Stratford shops of the Great Eastern Railway is noted.

The engine so erected is of the six-coupled type, cylinders 17½ inches by 24 inches, driving wheels 58 inches in diameter, boiler of steel and 52 inches in diameter, 10 feet long and containing 252 tubes 1⅝ inches in diameter.

When erecting began the frame plates laid flat on the ground with the hornblocks and spring brackets fixed to them, but otherwise free of attachments, the work having been prepared in the same way as usual for the erectors. At 11 minutes from the start the first rivet was put into the frames, at 20 minutes the foot-plate casting was fixed, and at 26 minutes the motion plate was in place. The setting and fixing of the cylinders occupied from 27 minutes to 1 hour 7 minutes from the start, while at 2 hours 37 minutes the setting of the motion was commenced and occupied until 3 hours 52 minutes, when the men left off for their dinner hour.

Soon after recommencing work, namely, at 4 hours 7 minutes from ths start, the boiler was put in place, it having had its mountings fixed and lagging put on prior to being brought to the erecting shop, but being without smokebox, cab, or copings. At 5 hours 27 minutes from the start the engine was wheeled, the wheels having been supplied as they left the wheel shops and the eccentric sheaves having to be fixed, and the axle box and connecting-rod and coupling-rod brasses having to be fitted by the erectors. At 4.15 P. M., 6 hours 7 minutes from the start, the setting of the valves was commenced, this part of the work being still incomplete when work was stopped for the day at 5.30 P. M.

Next day work was recommenced at 6 A. M., and by 7 A. M.—8 hours 22 minutes from the start—the valve setting was completed, and 40 minutes later the side rods were on. Prior to this—at 7.15 A. M.—painting had been commenced, and by 9.10 A. M., or 9 hours 47 minutes from the start (there having been an interval for breakfast from 8.15 to 9 A. M.), the engine was completed and was taken out of the shop to be photographed.

During the erection of the engine, the tender was also being erected, and was finished before the engine, the men working the ordinary hours. Later in the day the engine ran its trial trip and was immediately put into regular work.

In erecting the engine the number of men employed was 85, made up as follows: Fitters (including three boys), 39; smiths, 2; boilermakers, rivet boys, etc., 44. On the tender the numbers were: Fitters, 16; boilermakers, 16; laborers, etc., 20, making a total of 52.

Of course this feat excited much interest and comment. Some inquiry was made of the paper recording the event as to what were the particular favorable circumstances that enabled the erectors to accomplish their task so expeditiously, and the reply indicates that the job was done under ordinary working conditions, except that a large force of men were employed and foremen and workmen exerted themselves to make a record.

"As regards the manner in which the engine was completed," says *Engineering*, "the fact of her being at once put into regular continuous work is a sufficient answer. As to whether the rate of production described could be maintained or not, our correspondent, who is a locomotive builder of exceptionally large experience, is as well able to judge as we are. There can be no doubt, we think, that given similar conditions the staff at Stratford could repeat the performance as often as they pleased. But the given conditions are, as our correspondent is well aware, not commercial conditions. No such feat could be performed without an amount of special supervision and attention on the part of managers and foremen, which it would be impossible to give in the course of ordinary routine working, while the cost of the work—owing to the necessity of providing much surplus labor—must necessarily be greater than when work is performed in the ordinary more leisurely fashion. Nevertheless, feats of this kind undoubtedly serve a useful purpose just as 'record breaking' in other matters undoubtedly has a beneficial influence on ordinary performances, and the means for carrying them out."

One correspondent, writing on the matter, said:

"The conditions of erecting in contract and railway shops differ considerably. These Stratford men are always on the same class of engines, and will know all the dimensions and parts without any reference to drawings, and it is one of the plainest, simplest locomotives that could be designed. The only operation I should like explaining is the painting. I suppose they put three coats on at the same time, while the steam was getting up, and lined and varnished just before starting with the train. This I do not think could have been done properly, as the painters could not be cleaning, priming, etc., while all hands were on the job working. It would be interesting to know how long it took the Stratford men to build the first engine of this type, probably about four months."

Pennsylvania Railroad Class "O" Boiler.

The illustration on the opposite page shows the class "O" boiler of the Pennsylvania Railroad. It is a Belpaire boiler, 57 inches in diameter, and designed to carry a steam pressure of 160 pounds per square inch. Following are the principal dimensions:

Boiler material	Steel.
Thickness of boiler sheets, dome	⅜ in.
" " " barrel and smokebox	$\frac{7}{16}$ in.
" " " outside firebox	$\frac{5}{16}$ in.
Max. internal diam. of boiler	57⅞ in.
Min. " " "	56⅛ in.
Height to center of boiler from top of rail	6 ft. 10 in.
No of tubes	196.
Inside diameter of tubes	1¾ in.
Outside " "	2 in.
Tube material	Wrought iron.
Length of tubes between tube sheets	11 ft. 4 in.
External heating surface of tubes	1,163.09 sq. ft.
Fire area through tubes	3.27 sq. ft.
Length of firebox (inside)	6 ft. ⅜ in.
Width of " "	2 ft. 10½ in.
Height of crownsheet above top of grate, center of firebox	5 ft. 9⅛ in.
Inside firebox material	Steel.
Thickness of inside firebox sheets, sides	$\frac{5}{16}$ in.
" " " " front	½ in.
" " " " crown	⅜ in.
" " " " back	$\frac{5}{16}$ in.
Thickness of tube sheets	½ in.
Tube sheet material	Steel.
Heating surface of firebox	93 sq. ft.
Total heating surface	1,256.09 sq. ft.
Fire grate area	17.34 sq. ft.
Diameter of smoke stack (straight)	18 in.

It will be noticed that the barrel of the boiler, 124¼ inches in length, is made of three sheets of 58, 37 and 39 inches in length respectively. The company is now constructing barrels of boilers up to 185¼ inches in length with but two sheets, each 96 inches wide.

Freight Car Trucks.

The Master Car Builders' Association issues the following circular of inquiry:

Do you use rigid or swing bolster truck?

Do you prefer rigid or swing bolster truck, and what are your reasons for such preference?

What has your experience been in the cost of maintenance of each kind of truck?

Have you any of the Fox pressed steel trucks in use, and what has been your experience with them?

How do you consider the Fox pressed steel truck compares with the diamond truck for 60,000-pound cars now in use?

Replies to these questions should be sent to Geo. F. Wilson, Superintendent Motive Power and Equipment, C. R. I. & P. Ry., Chicago, before Feb. 15, 1892.

The boiler of engine 585 of the Philadelphia & Reading Railroad exploded on the evening of Jan. 22, at Philadelphia.

Engagements of grain by steamship lines from New York to Europe are now limited only to the carrying capacity of the ships.

Care should be taken to keep the feed water for boilers from being contaminated with foreign substances, the carbonate of ammonia produced by the fermentation of urea in outhouses being very destructive, especially of new boilers before they are coated with scale.

George Stephenson once asked a friend what it was that caused the rapid motion of one of his locomotives. The reply was that the combustion of the fuel in the furnace was the reason. Stephenson, however, expressively corrected this, and referred to the fact that all the heat and effect produced were due to the rays of heat and light which had first been absorbed from the sun, and were given out again with their full force in the furnace; although, perhaps for thousands of years they had lain dormant in the bowels of the earth.

One effect of the improved business on the Western roads for the last few months has been to enlarge the ideas of the various managements as to what their expenditures should be in preparing for the World's Fair business. The Alton has already begun the construction of a number of larger, heavier and faster locomotives than any it has had in use, and other improvements decided on will cost close to $1,000,000. The Burlington has decided on a liberal expenditure. The cost of the additional equipment to be secured and the other improvements is now estimated at $2,000,000.

The crops of wheat and wool in the Argentine Republic are said to be the largest ever known in that country, and the railway companies are preparing for a busy season to recoup themselves for the great falling off in business during the financial depression. It is stated that there is no line of railway in the country that has rolling stock enough to carry the produce to market. The immense crops have also caused a revival of immigration, and thousands of foreigners are now arriving at Buenos Ayres seeking employment in the agricultural districts during the harvest. Wages have doubled and trebled, and even quadrupled in some districts.

PENNSYLVANIA RAILROAD CLASS "O" BOILER.

Locomotive Boilers.

At the meeting of the New England Railroad Club held at Boston, Jan. 13, President Twombly occupied the chair. A committee was appointed to nominate officers for election at the March meeting of the Club.

The president announced as the subject for discussion at that meeting "Freight Car Trucks" and the subject for the present occasion "Locomotive Boilers and Their Attachments," to be opened by a paper by Mr. J. L. Speirs, to be followed by a paper by Mr. F. W. Dean.

LOCOMOTIVE BOILERS.

By J. L. Speirs, of the Rhode Island Locomotive Works.

I will try to present some of the results of looking for several years at boilers for locomotives, from what I call a constructive point of view.

First, what the principal features of a good boiler for general use should be.

A. The heating and grate surfaces should be of such an area and character that with an ordinary quality of coal and attendance more steam may be supplied than can be used when the engine is doing its heaviest work.

B. The greatest simplicity should be aimed at in its construction, consistent with maintaining a proper degree of strength or factor of safety and confining the boiler within the usually allotted space.

C. The predominating idea in its designing should be to have the fewest pieces and parts possible. With this idea steadily in view the cost of maintenance as well as the first cost will be materially lessened.

D. The material should be of the best obtainable, the thickness so proportioned that all parts will have as nearly as possible the same factor of safety.

E. The grate area, where the firebox is between the frames, cannot be made too large, nor the grates with too much air space.

F. To help combustion, the firebox should be of the greatest volume permissible, without interfering with the spaces for circulation.

G. Parts subject to change of form should be rigidly braced, but not a brace used where its presence is but an encumbrance.

Retaining the shape of the boiler now in general use, perhaps the most perfect form of construction would be to make without joint of any kind, as with cast steel.

In regard to quality, no manufacturer has yet produced a steel too good for a locomotive boiler. The tendency of late with master mechanics and builders has been to specify a steel much lower in carbon and of a lower tensile strength than the steel used a few years ago. This change is in the right direction. I would even go farther, and advocate the employment of a steel of from 50,000 to 55,000 pounds tensile strength, instead of from 55,000 to 60,000 pounds, as is now commonly used. Such a steel will stand the strains of flanging, punching and bending, and will, I might say, rest easier in place in the completed structure then will a steel of a harder and less elastic nature. If the use of a steel as low in strength as advocated will, with the same thickness before used, lower too much the factor of safety, it would be far better, and I think in the end cheaper, to add $\frac{1}{16}$ inch to the thickness, draw our stays a trifle closer together, and use the more ductile metal.

Where existing conditions make it impossible to specify or obtain the best of steel for the whole boiler, it should be insisted on that at least the material for the firebox be of the very best. For the limited weight, the difference in the total cost would be inconsiderable, and would effect quite a saving in the usefulness and life of the boiler.

FIREBOX.—As I have before remarked, the firebox should be made roomy; by this I mean, it should be made as large as its outside casing or jacket will admit of, having at the bottom a space of 3 or $3\frac{1}{8}$ inches, gradually increasing this space to $4\frac{1}{2}$ inches or 5 inches at the top of the box, keeping the barrel of boiler high above rails, and so getting a good length of leg. There is no good reason that I know of why the crown should not be carried well up, leaving only sufficient space, where crown bars are used, to get in dry pipe and rigging, and space between bars and roof to admit of a good job on sling and backhead stays. The idea so often spoken of, so seldom put in practice, of making the flat sides of legs overhang the fire, should be carried out on every boiler made, say to the extent of $\frac{1}{2}$ inch to 1 foot. The effect would be that this part of the heating surface would be of increased value, and the plate less liable to overheating.

Many will object to the width of the water space I have named. I think an increased space would give greater economy, but believe also that we would get less duty from the given space.

I think the general feeling is that more water space is needed, but we do not feel that it can be spared from the inside of the box, and as there is not much chance of stealing from the outside, there the matter rests.

The making of larger water spaces means the curtailing of grate area, firebox and tube heating surfaces; that lost from the firebox comes mainly from the crownsheet, where it can ill be spared.

In view of all the experiments recently made to ascertain the evaporative capacity of firebox surfaces compared with that of the tubes, I consider it advisable to secure every square foot of firebox surface possible. The various authorities give the ratio of difference as from 5 to 1 to 10 to 1. The least is probably nearest correct in ordinary practice, where part of the flues are stopped up altogether, and many of those remaining are choked with partly coked coal.

I am a believer in good circulation for promoting the economy of the whole boiler and making it a free steamer. To accomplish this end, though, I think we should resort to some mechanical means or device whereby we will *know* we are accomplishing what is proposed.

We *suppose* a great deal, take a great deal for granted, in regard to how the water, after rising, again gets a chance to come in contact with the highly heated surfaces of the firebox. Why not by some device take the water from the colder parts and actually *force* it into the legs, in such a manner that there will be no doubt that you are getting a circulation, and that, too, in the right direction, upward, with no counter-current downward to impede the passage of steam to the surface? Another advantage of such a mode of water distribution would be that all parts of the boiler would be nearer an even temperature, thus getting rid of severe strains and promoting the life of the whole.

INJECTING DEVICE.—Water tables and kindred devices have been so far failures, for while they materially increase the heating surface the evaporative performance does not show a like increase, though the bill for repairs generally does. The source of their supply for circulation is so inadequate that the intense heat drives the water out to such an extent that the trouble from leaky bolts and joints is endless.

So far nothing has surpassed the water tube as a means of increasing the heating surface in the firebox, as well as for supporting that most admirable contrivance for helping combustion, the brick arch.

TUBES.—It is generally accepted as an established fact that tubes should be placed so that there will be a space, however slight, in the clear between the vertical rows. I would not speak of this but that within a short time I have seen the drawings from a large New England road showing the tubes spaced horizontally so as to leave a $\frac{5}{8}$-inch bridge, the tubes on the next lower row being placed directly underneath these spaces.

SHELL.—It is strange in making the shell or barrel so few avail themselves of a benefit which the steel manufacturers have been to so great an expense to bring about; I speak of the using of but one large plate. This would not only be in the line of greater simplicity, but it would also be much less expensive handling one plate instead of two. To see a section of boiler for use on a Mogul or eight-wheeler, as I have often noted, from 75 inches to 100 inches long, made in two telescopic rings, savors too much of the dark ages in the art of boiler work. With the improved tools of to-day there should be no trouble in handling plates up to 110 inches wide, or even wider.

Plates may now be procured from the principal makers up to 110 inches wide with a length of 230 inches and up to 120 inches wide for one 200 inches long. The outside casing or jacket of firebox should always be made with one plate where possible. By making shell in one piece, we eliminate a source of trouble and expense, a girth seam; it is easier to apply lagging and top work and unnecessary to consult about placing of seam in regard to position and fastening of waist and guide yoke plates.

While on this subject I would suggest another advantage of using a wide plate, in being better able to set a proper pitch for the rivets in the longitudinal seam; a point with a certain sized rivet and thickness of plate it is sometimes impossible to attain with a very short seam.

It is a very common practice to make the shell and wagon top, when even the shell and back end vary in diameter from 10 to 12 inches, all of one thickness. This practise is wasteful, for if the plate be of such a thickness that we get a proper proportion of strength for the wagon top and connection with say $\frac{1}{2}$-inch plate, then the shell would be equally strong or a trifle stronger with $\frac{7}{16}$-inch plate. I believe in erring on the side of safety, but I do not believe in the waste of good material. I have in mind a case where a 42-inch diameter straight boiler was specified to be of $\frac{5}{8}$-inch steel, while another boiler for about the same pressure, 56-inch diameter of shell and 66-inch diameter of back end, was also specified to be of $\frac{5}{8}$-inch thickness. If the thickness for the smaller one be right, for the larger diameter it should be nearly $\frac{7}{8}$-inch to secure the same proportion of strength.

STYLE OF BOILERS, RADIAL STAYED.—The tendency of the day is to discontinue the use of the old crown barred style of boiler. Anyone who has given the matter thought, or who has looked into the merits of the radial stayed type of boiler, more especially the latest style with extended wagon top, cannot fail to be convinced that its more extended use is in the line of progress. Here we are more nearly approaching the ideal of simplicity. In actual numbers the use of radial stays on, say a boiler designed for an 18×24 inches engine, does away with 960 pieces; these include crown bars, washers, bolts, nuts, links, braces, crowfeet, lugs, pins, rivets, etc. One will scarcely credit that there is a total of 1,198 pieces and parts due to the bars and braces for same. The weight of this mass is 3,585 pounds against 1,064 pounds in radial stayed type.

Perhaps the very worst feature of the boiler under discussion is that the angle at which three or four of the rows of bolts enter the outside sheet makes the operation of heading or riveting over of the end a difficult matter, as the blow from the hammer does not fall in a line parallel to the axis of the bolt, neither is the holding on of the other end during the operation entirely satisfactory. By using care in fitting the bolts to the holes and skill in heading over, however, a an object of importance to have two rows of stays each side of the center on top, made with a head and screwed in from inside the box. These are mainly put in as a measure of safety in case of low water. The solid heads are preferable to nuts for two reasons. First, their greater holding power; second, it is possible by their use to secure a good fit of bolt in the crown sheet, a thing you are not sure of when a long bolt has got to be screwed through from the outer sheet, as often the threads do not match, and are injured in passing through the hole in crown. With the long straight bolts the dependence for tight joint is all on the contact of the copper washer against the under side of crown. The thread on the headed bolt is cut close under head in a lathe, and then sized with a sizer slightly tapered, so that a steam tight fit is secured in the holes.

The lack of tools adapted to such work has been the one thing more than any other that has kept the screwed stayed boiler in the background, for any little trouble experienced in its manufacture is more than compensated for in its use by the complete accessibility of all parts for cleaning and inspection; a free steam space, with the dome well forward of the point of greatest agitation on the water surface, insuring the supply of dry steam.

Another point of excellence is in the increased water holding capacity, a large part of which is in the solid body over the crown.

In actual figures, taking as before, a boiler designed for an 18 × 24 inch engine, in a space of seven inches above and immediately over the crown, the boiler with crown bars will have 83 gallons of water; without crown bars or other incumbrance, the amount in the same space would be 136 gallons—39 per cent. of the water holding space lost, and what remains is so cut up that with a hot fire the water must be tortured to froth in its effort to send steam to the space above.

The radial stays for an equal distance above the crown displace but four gallons of water; this leaves a difference of 49 gallons in its favor. Nor is this the total gain in water around the firebox. On either side, starting from the center on top, the crown curves downward to such an extent that here a gain is made of 41 gallons, or 91 gallons in all around the box. The crown of the radial stayed boiler we are comparing has its crown raised three inches higher than the other, and has an extended wagon top, and contains when filled to second gauge 1,427 gallons. The boiler with bars contains 1,048, or 378 less. Too much importance cannot be attached to this feature, as this extra amount of highly heated water ready to flash into steam will, when increased power is required, act as a reserved force. Suddenly starting the injector full force will not alter the temperature of the water to the same degree; neither will the water level fluctuate so rapidly, as the whole body of water above the crown is practically solid. It is evident, from the shape, that the volume and surface of the firebox have been reduced, the first, $5\frac{1}{2}$ cubic feet; the other 11 square feet, out of a total of 141. This is an apparent loss. A large part of it must be made up in the greater efficiency of the surface remaining, as a curved surface or crown is presented to the fire, of 66 inches in breadth against 56 inches in the other type.

BELPAIRE BOILERS.—Unquestionally the Belpaire boiler has merit. It is a favorite with many master mechanics as being a rapid and free steamer. I have noticed several times in reports of conventions and in the discussion of railway clubs that it was favorably mentioned on account of its free crown surface and accessibility for cleaning same. Those who talk in that manner surely never made an inspection of a Belpaire box from a point of view inside the shell. The number of vertical and horizontal stays mingled with those from the back head present an almost solid look; to use a scraper would be an impossibility, and even a stream of water would lose all force as it was divided and subdivided.

The same argument that applies to the four center rows of radial stays applies also to the crown of the Belpaire box. It will pay to make them with heads and screw in from inside the box.

FLANGING.—The flanging of a locomotive boiler is the hardest and most difficult operation in its construction. Much in its utility and life depends on the manner in which this work is done. The material has gone on year by year increasing in thickness, making the labor of shaping it more arduous, the strength of the men all the while remaining the same. The limit is near: with $\frac{1}{2}$-inch plates on the average and $\frac{5}{8}$ inch not uncommon, soon, I feel confident, we shall be making boilers for compounds to carry a pressure of 250 pounds and made of $\frac{3}{4}$-inch plate. Even with such work as is done now, it is almost imperative with builders to provide themselves with a flanging press. Its general use will mark a new era in locomotive boiler construction.

RIVETING.—With the thickness of plate now in common use, all boilers should be built with butt-jointed longitudinal seams. With a lap joint, the thicker the plate the greater the departure from a true circle. This distortion of form the heavy pressure now carried tries to correct. This tendency to buckle the plate in such a manner as will nearer approach what should be its proper shape is a source of weakness and is the cause of many leaky joints and rivets. The welt, where used, has been a more or less efficient safeguard against grooving, still it is not the correct thing and with $\frac{1}{2}$-inch plate or over nothing but a butt-joint seam, with inside and outside covering strips should be used. By using a wider strip inside than out, placing six rows of rivets in the inner one and four in the outer, we can get nearer the full strength of the plate than by any method save welding—a practice as yet not common in this country. By properly proportioning rivet and plate area a joint may be made to 85 per cent. of the solid plate. Circumferential seams should be double riveted, not so much as a measure of strength to resist pressure, but to better resist the strains and shocks received by engines in service and the tendency to grooving along bottom, due to differences in temperature between top and bottom of shell. Every rivet possible should be driven with machine. It is becoming possible to so drive a greater number owing to the improvement in machinery for the purpose; the later ones having a greater reach and scope. There are several of the smaller portable machines for special parts. I would specially recommend the use of one of these in the closing of the rivets in the firebox ring. By using such an appliance a rivet $\frac{3}{4}$ inch longer may be driven than could be closed by hand and after the operation leave no larger head, the extra length having been forced into the long hole, completely filling it.

The head is also changed in shape by the holding-on die, which forces part of the metal from the head into the hole, making both ends equally to be relied on for tightness. Were such a machine in general use, leaky mud rings would be a thing of the past, except, perhaps, in the inside corners. The remedy for the gradual wasting away of these are not to be sought in riveting, but rather in the increased flexibility of parts at bottom, a remedy difficult of application, for we c nnot work outward. By raising the grate a few inches and curving the bottoms of the four plates forming the box inward, until a six-inch water space was obtained, we could insert a ring of pressed boiler steel, with flanges looking downward. Whether this construction and width of ring would give flexibility sufficient to allow the firebox to move downward and horizontally enough to greatly help staybolts, rivets and corners, I am not prepared to say, nor do I know that it would, in the end, pay for the extra expense and trouble; it only occurred to me as a probable remedy.

STAYBOLTS.—I am convinced if our fireboxes were free to expand from the center of side sheet in all directions we would have little trouble from broken staybolts. Higher pressures may be responsible for part of the trouble lately experienced, but, if investigated thoroughly, I think thicker plates, higher and longer boxes, will be found to be the chief causes. With the thicker plate now in use for the outside covering the staybolt is held so firmly and the plate is so stiff that there can be little or no movement; consequently as the box expands upward and lengthways under the intense heat to which it is subjected the whole bending stress comes on a point just inside the outer sheet in which they are so rigidly held. Most of you will remember that when $\frac{5}{16}$-in. and $\frac{3}{8}$-in. plates were used it was a very common thing to see the casing of a box flake away inside around the staybolt holes at just the same locations as are now giving the most trouble, top rows and end vertical rows. Sometimes while the sheet would be flaked away the bolt would be perfect. At other times it would also be reduced in size at the point of contact and part way into the plate. I have seen sheets countersunk in this manner nearly through. This occurred because the sheet, compared with the bolt and strain, was comparatively thin and flexible; the bolt sprung the plate and also worked in the hole.

While drilling bolts tell-tale will indicate when a bolt has broken; it in no way acts as a preventive. Some remedy or escape there must be and it should be sought. A larger bolt, of say $1\frac{1}{8}$ inches or $1\frac{1}{4}$ inches, would make the ratio between plate and bolt somewhat the same as when the bolts were $\frac{7}{8}$ inch and plate $\frac{5}{16}$ inch or $\frac{3}{8}$ inch. Even if this worked in the same manner I do not think it right to cure one evil and cause as great a one, I would not sacrifice the plate to save the bolt.

Turning bolts down to the bottom of the thread, leaving but two inches of thread at each end, is by no means a new thing in boiler work, but has been generally used on long stays to save time in cutting and running them in. I would like to see the experiment tried of using 1 inch bolts turned down to $\frac{7}{8}$ at a point, which when in place would be one-third of the width of the water space from the inside sheet, then taper out each way to full size at a point $\frac{1}{4}$ inch or $\frac{1}{2}$ inch from the inner face of both sheets. Perhaps to make such a test of value, it would be well to put in every other bolt made in this manner and the others of full section. The length of life and usefulness of each could then be tested under the same conditions.

BRACING.—For the support of the backhead above crown and fronthead above tubes the simplest brace is the long rod from end to end. Where such a brace is well supported at about the middle it is an efficient stay. Where not so supported it will give trouble by leaking or breaking at the ends. A 17-foot or 18-foot rod will vibrate badly when the engine is in motion.

A liner $\frac{5}{8}$-inch or $\frac{1}{2}$-inch thick on the inner side of backhead, extending down to take the top row of staybolts, stiffens that part and better distributes the strain on the staying. Some oppose the staying of backhead to shell or connection, on the ground that by so doing these parts are subjected to great strain, the angle of the stays causing a tendency to flatten, the direct pull to tear the shell asunder, and, again, that the extra holes for attachment will unduly weaken the plate. As a matter of fact, the braces from backhead when carried to shell have a very slight inclination; most of them being in a direct line, any little strain set up the plate is amply able to resist, aided as it is by the pressure within. In regard to the holes for the attachment of braces, as the measure of the strength of the shell is the resistance of the longitudinal lap to tearing apart under pressure, the holes for two or even three braces in a line across an ordinary shell plate are not going to leave the plate as weak as at the joint.

If in putting stays from crownbars to roof, two to each bar, placed from 6 inches to 8 inches each side of center, are not thought sufficient; rather than put on four as is often done, it is better to increase the size of both stays and crownbar. Where crown-bars are used they should be of ample strength to sustain their load without aid; the sling stays being applied as a measure of safety in case of overheating.

TESTING.—Locomotive boilers are not usually tested high enough to warrant carrying of such pressures as 160 lbs. About all insurance companies make it a rule to add 50 per cent. to the pressure allowed for the test pressure. The practice I think is a good one. It is better to make this test for safety with warm water. The test for tightness should be made later with a steam pressure of about $1\frac{1}{4}$ times the working pressure. A boiler made tight under a water pressure is seldom perfectly tight under even a less pressure of steam, and the same would be true of steam first and water afterward. It is better to make the final test under as nearly as possible the working conditions.

LOCOMOTIVE BOILERS.

By F. W. Dean.

I believe it is estimated that there are about 150,000 locomotives in existence, and with few exceptions they have the usual form of stay-bolt boiler. The inference might therefore be drawn that this is the safest type of boiler in existence, as an explosion is comparatively unknown. There is, of course, an occasional explosion, but this should not be placed to the discredit of the boiler.

Let us glance at the service which the boiler performs, and in order to appreciate it, a comparison of its duty with that of stationary boilers is interesting. A stationary boiler when working at an economical rate evaporates some two or three pounds of water per square foot of heating surface per hour, but the locomotive evaporates seven to fifteen, more commonly ten to twelve. The stationary boiler is allowed eight to fifteen feet of heating surface per horse power, but the locomotive boiler has but one to four. The temperature of the escaping gases of stationary boilers is not much over 400 degrees, while those of locomotives have ranged from 600 to 1,200, very commonly 800 If the pressure is150 pounds per square inch, a pound of steam occupies a volume of 2.75 cubic feet, and 15 pounds occupies 43.75 cubic feet. Such a rapid formation of steam calls for a full opportunity to escape and points to the undesirability of overhanging furnace side sheets. The heat from the fire is transmitted into the water by the staybolts, and the larger the heads the more efficiently this is done.

The severe service to which the locomotive boiler is subjected is more apparent when we consider the amount of coal burnt per square foot of grate per hour. In stationary boilers it is from five to 20 pounds, in locomotive boilers from 60 to over 200. With these consumptions the evaporation per pound of coal is low, with good coal five to seven pounds of water. The boiler is subjected to great and sudden extremes of temperature, for if it steams too freely the door is opened wide. Recent tests of the quality of steam shows that even when working hard the boilers of locomotives send over less than one-half of one per cent. of moisture, less than is found in many stationary boilers. This is due to large water surface and steam space. No locomotive boiler was ever too large or is likely to be, for the reason that from the point of view of economical use of fuel the boiler is always overworked.

The first matter to decide upon with reference to a boiler is the quality of the material. It is easy to obtain good steel from the various makers throughout the country, and it is probable that any maker can deliver good firebox steel if required.

The most valuable quality which boiler plates can possess, provided it is not at the sacrifice of any other, is a high elastic limit. By elastic limit is meant the greatest stress per square inch to which it can be subjected without injuring its elasticity. If the steel is strained within this limit it returns to its original length after the load is removed. If the stress goes beyond this limit the steel breaks down, so to speak, is out of shape, and the boiler becomes leaky. A boiler should have its factor of safety determined with reference to the elastic limit and not with reference to the ultimate strength of the plate. This shows how unnecessary and unwise it is to specify the ultimate strength, except the upper limit, in order to prevent an excess of carbon. In other words, if the elastic limit is brought about by working a low carbon ingot and is accompanied by great elongation and contraction of area upon being tested, it should be the most important quality of steel. It is well known that it is easy to secure a high elastic limit in thin plates on account of the amount of work which is put upon the ingot by the rolls. This points to the importance of having thick ingots for thick plates, and an ingot some 25 times as thick as the plate to be rolled gives good results.

Besides tests for elastic limit, elongation and contraction of area, it is well to have quenching and bending tests. This is done by heating a piece of plate to a cherry red, plunging it in water and then bending it over a cylinder whose diameter is twice the thickness of the plate. Most steel will, however, bend down flat under a hammer after quenching, without fracture.

For fire plates it is best to be content with a low elastic limit, say 30,000 to 32,000 pounds to the square inch, and to secure strength by thickness of plates and frequency of stay bolts. Test pieces should be long enough to give the elongation in no less than 8 inches in order to enable us to judge better of the material, for if the length is restricted we compel the elongation to take place in too small an area to be representative. Every effort should be made to prevent any part of boiler plates being strained up to the elastic limit. Plates can be so strained by punching and flanging. If holes are punched $\frac{1}{16}$ inch small and reamed to size, the injured material is mostly removed, but the proper way is to drill all holes in place. When a boiler shop is once fitted for this work the expense is but little greater than for punched work. If reaming is done it would be better to drill the holes of an inner plate with the outer punched hole as a guide. This assures fairness of holes and avoids eccentric reaming. If both holes are punched the reamer will become inclined and cause eccentric reaming in both holes and remove only a part of the injured material from each.

A plate-closing ram of a riveting machine, unless used with care, overcomes the elastic limit by making a circular indentation around the rivet hole. Considering that this is the weakest part of the boiler, viz., the joint, it should be particularly avoided. The elastic limit is often overcome by flanging, and this indicates the importance of annealing plates after flanging. This would probably delay the almost inevitable cracking that takes place in the throat sheets of boilers when they are spread out to join the circular part of the shell. The inner sheets without doubt become annealed in service, so that if they do not crack when new they are not likely to do so.

The general direction of the circulation in locomotive boilers is upward at the firebox and forward in the upper part of the boiler, downward at the forward end and backward at the bottom. It is obvious that the more freely this natural movement takes place the more freely the steam escapes. The escape is undoubtedly facilitated by the jar of the engine, and this is an advantage which the locomotive boiler possesses over stationary boilers of any kind. Now let us see what obstructs circulation. It would be obstructed by an insufficient feeding of the water spaces, and for this reason I advocate a very wide front water space in order to properly feed the side spaces. I advocate side sheets which do not follow the form of the outside sheet, but which are slightly inclined inward, provided no disadvantage follows. When the firebox is between the frames, as is generally the case in New England, this makes a narrow firebox at the top, but it can accommodate a wide tube sheet by being flanged out forward. This has been the practice on the London, Brightou & South Coast Railway for many years.

Circulation can be facilitated by abandoning transverse crown bars, as they obviously intefere with the upper horizontal current of water. The general circulation in the barrel can be facilitated also by using a large shell and placing the tubes far apart, and by placing the tubes farther apart horizontally at the front end than at the other. The inclination of the tubes to the tube sheets is so slight that the tubes are as tight as usual. The writer has practiced this method for several years in stationary boilers. Inclining the side sheets of the firebox not only promotes better circulation but gives greater elasticity to the upper stay bolts by making them longer, and this prolongs their life. The usual method of accomplishing this desirable end is to use enough staybolts at the top to make the structure in that vicinity sufficiently strong and rigid to throw relative movement between the plates elsewhere. The long staybolts would render this unnecessary, or if more strength of stays is necessary at that point, a larger diameter of bolt can be used. Another advantage of the narrow crownsheet is that fewer crown stays are needed; shorter bars can be used if they are transverse, and fewer if they are longitudinal. The longitudinal bars, besides interfering with the horizontal circulation less than the others, permit the longitudinal tierods to be placed where they are needed for properly staying the back head. I have seen some boilers that have these rods dangerously far apart. In order to properly support the longitudinal bars, the outer crownsheet should be stiffened with two heavy T irons from which the bars can be supported at two points in each, as in English practice.

Next let us examine the form of the boiler about the fire box. The circular form of a flexible thin shell is the form which it takes when subjected to uniform internal radial pressure, and therefore if it is circular it is in equilibrium and will maintain its circular form when subjected to such pressure, and not otherwise. Let us examine what occurs with a crown boiler under pressure. There are in many cases as much as 200 tons of pressure tending to force the inner firebox downward out of the boiler. How is this pressure resisted? It is resisted by the base or mud ring at the bottom, which tends to rotate, (and this points to the advisability of double riveting this ring,) by the stiffness of the staybolts, and by connections from the crownbars to the shell above. The crownsheet, of course, tends to go down, and actually does so, as I have found out by experiment. In doing this it bulges out the curved sides of the inner firebox. In depressing, the crownsheet seeks assistance from the outside crown, but this being in equilibrium from internal pressure, and thin, is as unable to resist distraction from this cause as a distended toy balloon is unable to resist the pressure of the finger. It therefore depresses and the sides bulge out. The inner crownsheet surely goes down, the sling stays are in unequal and absolutely unknown stresses, the upper and other staybolts are bent, and all conditions for over straining and breakage are present.

Transverse tie-rods just above the crownsheet simply modify the unknown stresses, but do not simplify the chaotic condition of them. This is enough to cause staybolts to break, and in my opinion is the great cause, rather than the expansion of the side sheets. The depression of the outer shell forcing out the sides assists in cracking the upper part of the throat sheet. Another common feature of construction assists in this last phenomenon. I refer to the common practice of not using a circular form to the outer crown sheet, not that this would do any good to this sheet, but it would give circular cross-sections to the conical part of the shell immediately in front, thus avoiding a flat place on each side. This flat place tends to bulge out, and assists in cracking the throat sheet.

The radial stay system has the same faults as far as stresses in the parts are concerned. When the boiler is under pressure the stays are in unequal and unknown stresses, and many parts must be dangerously strained. The Wootten variety of this form is an extreme case, and its weakness is more apparent. If we take a cross section of this we shall see that the pressure acts upon the sides as it does upon a Bourdon tube in a steam gauge, and it tends to straighten out as the tube does. It is easy to see that the tendency is to pull the staybolts out of the thinner sheet. This shows the necessity of tying the sides of the mud ring to each other at intervals. My own opinion of all the forms of boiler thus far described is that they are unsafe. Any structure in which the stresses cannot be computed is likely to be unsafe.

Now let us see if there is not some form of boiler which is free from all of these defects, in fact a boiler which possesses nothing but virtues. If we had a boiler which tends to lift up the crownsheet as much as that sheet tends to go down, it is evident that there would be no pressure tending to force out the firebox, to rotate the base ring, to bend the staybolts, to render computations useless, and to distort the outer shell. The Belpaire firebox, named after its distinguished inventor, has these qualities, and the principle of its design is this, that any flat surface of the inner firebox has a companion equal flat surface upon the outer. This permits the corresponding surfaces to be stayed together by staybolts of various lengths, and all pressures are perfectly balanced. Moreover, as the stayed plates are flat they are elastic and yield to movements produced by changes in temperature. Every part can be properly stayed, the stresses properly computed, and the conditions of stress are not changed when the boiler is hot.

This boiler is safe with any pressure for which it is designed. As the crownsheet does not go down staybolts will break less than in any other boiler. Circulation is free over the crownsheet, water surface and steam space is great, and longitudinal tierods can be placed where needed. The weight is a minimum because every part is proportioned for its stress.

With this boiler carefully worked out I should not anticipate any cracking of the extremities of the throat sheet.

Of course boilers of this kind can be imperfectly worked out and trouble will follow, but what I mean to say is that if this boiler is properly designed most boiler troubles will disappear. Flat places should be carefully sought out, and there should be no staying between the back head and this outer crownsheet

Of course there is no difference of opinion as to the superiority of the butt joint for boilers with inside and outside covering plates. The circular form is preserved best by it, and it gives the strongest joint. In case an extra strong joint is wanted—and who does not desire it?—the inside plate can be extended beyond the outside and one or more rows of wide pitched rivets placed through it and the shell proper. In this case the inside plate should be as narrow as is consistent with the object in view, because any inside plate tends to straighten out between the rows of rivets and thus be ineffective in a measure. This plate should be as thick as the shell in order to minimize such a tendency, but it should be pointed out that this tendency would not exist if the inside plate should be calked, and thus the steam prevented from getting between it and the shell. The calking cannot be done, however, unless the covering plate is very thick and scalloped around the rivets. Whenever a joint is made in this way, and it is not uncommon in foreign marine works, the narrow plate is placed inside and the wide scalloped plate outside. This makes the strongest possible joint and probably has an efficiency of nearly 95 per cent. of the boiler.

While upon this point I wish to point out the deceptive nature of a joint that is frequently seen on locomotive boilers. I refer to the lap joint with an inside bent covering plate. I have watched the behavior of large sections of this joint in the Watertown testing machine and can testify to the all but uselessness of the welt. Its action is to straighten out and allow the main part of the joint to be ruined before it is pulled taut, at which time, of course, its own elastic limit is passed at the bend. Such a welt should always be thick and the rivets nearest the bend should be as close as possible to it.

Concerning tubes, many people believe that long tubes are objectionable. It should only be remembered that the smokebox temperatures of our locomotives are between 600 degrees and 1,200 degrees, while the temperature of the steam is not usually much above 300 degrees. We either want longer tubes or more tubes of the present length. In other words, in the usual type of bituminous coal burning locomotives the heating surface should be more than 73 times the grate surface, which is the common ratio. In France this matter of tube lengths has received much attention, and tubes 16 feet long have been used for years.

In conclusion I wish to call attention to the device of a Frenchman for increasing the heat absorbing surface of tubes—the Serve tube, which has longitudinal internal ribs, thus increasing the inside surface some 90 per cent. These ribs not only possess more surface, but the ribs slice up the gases and abstract the heat from the center. It seems to me that this provides a most promising means of cooling down the gases in locomotive boilers. Tests have shown an increase of evaporation per pound of coal of some 10 per cent. to 15 per cent.

MR. LAUDER: I have heard these matters discussed for the last 30 or 35 years by scientific men, practical men, constructors of boilers and users of boilers, and have heard the poor old locomotive boiler sadly abused, yet for 60 years it has done its work, and done it well. I have never been able to discover the weaknesses in the old locomotive boiler that Mr. Dean mentions. He says that the boiler we are using is a dangerous thing, and yet while there are tens of thousands of locomotives in use all over the country, using all kinds of water and fuel, run by all kinds of men, some with good care and some with poor, there is scarcely a case on record where a locomotive boiler has exploded; occasionally there is one, generally an old one. If a boiler is properly built and tested, properly inspected and taken care of, and the repairs looked after when weaknesses are discovered, there is little danger of explosion. I have never discovered any particular merit in the radial stay boiler. With the good water we have in New England, I see nothing wrong with the ordinary type of boiler, with the firebox stayed with crown bars; it has stood the test of service for a good many years. Where the water is bad, impregnated with alkalies, the crown sheets are soon used up, and the radial stay boiler is better for use; but under the circumstances, I should prefer to use the Belpaire boiler. That boiler practically is right, but it has developed some weaknesses, possibly due to not being properly designed. Whether it can be designed to stand the rough usage which most locomotives get, I think is an open question. It has the merit of having flat surfaces both of the inside box and the outside shell. The theory that when a boiler is under high pressure the outside circular crown is flattened by the pull-down of the sling stays I think is largely imaginary; if that occurred to the extent sometimes supposed, the plates forming the outer crown would soon give way. It is true that that has sometimes happened. We have had longitudinal cracks develop in the outside crown of locomotive boilers, but it was always where that outside crown was made in three sheets, with a double-riveted lap seam, which invites this trouble. With regard to the supposed want of circulation in the locomotive boiler, I think the circulation of water in a well-designed modern locomotive boiler is almost perfect. Were it not so, with the intense heat that is generated in the furnace, the plates would soon show the effects of overheating.

MR. DEAN: Mr. Speirs has shown by direct experiment that the crown sheet does go down on the side; he found it went down over .06 of an inch, and it is not unreasonable to suppose that the middle went down further. I remember a 90-inch boiler with a $\frac{9}{16}$-inch plate, and the outer crown sheet was stiffened up very much by heavy bars riveted to it. I put a templet on that boiler, making it go over between two certain points, and found the middle of the outer crown sheet fell $\frac{3}{32}$ of an inch.

San Francisco railroad men consider that the road now building to the eastern border of Nevada by the Rio Grande Western will be soon on the way to the Pacific coast through California via the Beckworth pass, where rails are laid and the road graded through a considerable portion of the pass. From the pass two routes lead to San Francisco, one through the Valley of the Sacramento, and the other following the coast more closely and reaching tidewater just north of the city.

A French engineer has invented a system of automatically stopping a train when approaching another train on the same track. It consists of a valve placed under the locomotive in connection with the brake pipe, so arranged that a metallic arm will apply the brakes to the train when meeting any obstruction. Between the rails are placed levers about a mile apart, operated either by electricity or mechanical connection. A train in motion raises these levers, both in front and behind it, so that a train approaching in either direction has the brakes applied by means of the lever striking the metallic arm on the locomotive and the train is brought to a standstill without any action on the part of the engineer. The apparatus can also be arranged to act when signals are set for danger, the lever being depressed when the signal is set for safety.

The Toledo, St. Louis & Kansas City Railway (Clover Leaf) is making great improvements, much to the pleasure of their patrons and the general public. They have put in lots of ballast, new steel rails, new bridges, and fixed up the track in splendid shape They are building large and complete shops at Frankfort, Ind. They have just received 500 new box cars, They have recently placed an order for 10 latest improved locomotives. The chair cars the St. Charles Car Company are building for them are to be the most handsome chair cars running on wheels. They are mahogany finish, have large smoking room, ladies and gentlemen's toilet, Scarritt's latest chair, figured plush and carpet to match, buffet attachment, which is a new and novel idea in a chair car. They will serve lunches same as in a Wagner buffet. The people along this line express themselves as highly delighted with the grand progress President S. R. Callaway is making and the attention given his patrons.

To railroad officers and others wrestling with duties and responsibilities that harass mind and soul, the witty summary by Dr. Garretson of "Equilibrium as It Relates to Disease," in a recent lecture, should be a warning: "The meaning of medicine as a science lies wholly with absence of ease on the part of men. If every person were in a state of ease there would be no occasion for either a science of medicine or doctors. Ease is the natural condition, but by reason of a large variety of things, men get out of a state of ease. To express the condition of men when not in a state of ease a reversing word is required. The word is the little Latin preposition 'dis.' Here is the governing principle of medicine. It has to do with disease. Everything that converses ease is a dis. Absence of money, a tight fitting boot, an overstiff shirt collar, a rent in the back of one's coat, mental distress—all these are conversers of ease, consequently are types of the dis. Disease, as the word is written without the hyphen, covers the ground. Disappearance of the dis leaves ease remaining. The rubbing away of the dis is the open sesame of all medical practice."

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

THE RAILROAD CLUBS.

As we go to press on the morning of the 27th, reports of the proceedings of the January meetings of the Central and Western Railway clubs have not reached us; and as we can wait no longer are obliged to forego the pleasure of having them appear in this issue.

CAR VENTILATION.

We gave an abstract in our last issue of a report of a committee of physicians to the American Public Health Association upon the sanitary conditions of passenger cars. That part of the report relating to the ventilation of cars was omitted for lack of space. In it the question of improved ventilation was considered from the standpoint of the passenger, simply as it affects health and comfort; and means of improvement were suggested.

Some of the means suggested are impracticable, as, for instance, depending upon an apparatus operated by the car axle in motion to pump air under pressure into the car. It would be impracticable because unreliable, as in case of delay or accident it would be inoperative; and as both the warming and ventilating of the car would depend upon the working of the apparatus (it being intended to warm the car with previously heated air) serious discomfort and suffering might result in cold weather.

It must be acknowledged that little progress has been made in ventilating passenger cars since the present type of car was adopted, and also that the means of ventilation provided are often wretchedly operated through the carelessness of trainmen.

The comfort of the larger and intelligent class of passengers depends greatly upon the condition of ventilation of the cars they occupy, and that this is often shamefully bad is patent to any one upon entering the car from the purer air outside. Especially does this apply at night, when there is less opening of doors, and when trainmen are not so alert in the performance of their duties as in the day.

It is said that if the condensed breath collected on the cool window panes of a room where a number of persons have been assembled be burned, a smell as of singed hair will show the presence of organic matter; and that if the condensed breath be allowed to remain on the glass for a few days, it will be found, on examination by a microscope, that it is alive with animalcuæ. Breathing air containing such putrescent matter must cause many complaints which might be avoided by improved ventilation.

Much sickness and many deaths have resulted from severe colds caught from open car windows that have been raised because of intolerable ventilation. No doubt the one who raised the window was much to blame for disregard of the comfort and health of others, but the bad ventilation that prompted the raising of the window and the custom of having windows movable at the will of indiscreet and selfish passengers are also to blame.

WINTER RESISTANCE OF TRAINS.

At this season of the year when traffic is nearly always heavy, and being this year phenomenally so, railroads are confronted with the fact that because of the increased resistance of trains to being pulled in cold as compared with warmer weather, fewer cars can be hauled per train. Instead of increasing the tonnage hauled per train, as would be desirable in view of the great rush and recent blockade of traffic, trains must actually be cut down, according to the prevailing temperature, to two-thirds or one-half of the tonnage hauled easily in summer.

With the motive power and other facilities of a road heavily taxed to handle traffic with the ordinary weight per train, it often becomes impracticable, when the weight per train must be cut down, to increase the number of trains sufficient to handle the traffic properly, and delays and blockades with their attendant losses follow. Thus it is that the effect of cold is to decrease the efficiency of railroads. In view of the losses that unavoidably follow, and the greately increased expense of moving traffic, it appears that the cause that produces this disastrous effect is worthy of examination, and such discussion as may lead to a general understanding of it by all concerned, thereby, possibly, effecting some improvement. Yet of all matters pertaining to railway rolling stock and the movement of traffic there has been none so little discussed.

Friction acts in many different ways to retard trains in motion. By the friction of the air against the exposed surfaces of a train; the friction of the wheels rolling upon, and their flanges against the rails; by the friction of the rubbing surfaces of the locomotive's machinery, and of the axle journals of train and engine rolling against their bearings, the motion of trains is retarded; and, finally, by the friction of the brake shoes against the wheels, trains are brought to rest when desired.

There is another way in which friction acts to retard the motion of trains, and it is this form of friction almost absolutely that causes increased train resistance in cold weather, with clean rails. Fluid friction, the friction between the particles of a fluid in motion, in our case the friction between the molecules of the oil lubricating the axle journals of the train and engine and the external rubbing surfaces of the engine's machinery, is a form of friction that acts almost exactly the same as the friction between solids—and retards motion.

The resisting force of this friction in oil depends entirely upon its state of consistency, and in ordinary lubricating oils this depends entirely upon the temperature. Carefully conducted railroad laboratory tests have demonstrated that with a fall of temperature of 70° the friction was doubled with the same lubricating oil. The colder the oil the greater is the viscosity, and the greater the viscosity the greater the friction between the sticky layers of oil adhering to the journals and their bearings in rubbing against each other, thus increasing the resistance of the train to being hauled, making necessary a reduction in the weight of train, and, as stated, lowering the efficiency of the road.

The larger portion of the greater fuel consumption of locomotives in winter is also due directly to this cause, although the colder feed water, radiation, and colder air and fuel for combustion are important factors. Because of the friction in the congealed lubricating oil, locomotives use steam over many *more miles of road* each trip in winter than in summer. This is brought about in two ways. First, by causing trains approaching stations to "hang back" after steam is shut off, thus compelling the use of steam probably a quarter of a mile closer up to each station than is necessary in summer, and second, by preventing the trains from running down hill freely, compelling the use of steam while descending grades that in summer the trains run down several miles at the desired speed without any assistance from the engine.

The increase of locomotive fuel consumption due to colder temperature very materially increases operating expenses in winter. Carefully kept records of the variation of temperature and of locomotive coal consumption, on a prominent western railroad, showed the average variation in coal consumption, per one degree of varied temperature for four years, to be .06 pound coal per passenger car mile, and .03 pound coal per loaded freight car mile. At this rate a fall of 50 degrees in temperature would cause a freight engine to burn 1.5 pounds of coal more per car mile, and a passenger engine 3 pounds more per car mile. If the freight engine hauled 18 cars 100 miles the extra coal consumption would be 2,700 pounds, and if the passenger engine hauled five coaches 100 miles the extra coal consumption would be 1,500 pounds. This is not very far from the actual results in practice. The average extra coal consumption of the engines in the two classes of service due to the colder temperature would be a little over one ton per trip of 100 miles. On a railroad operating 470 locomotives, each making 100 miles per day for a month, this excess in fuel consumption, as stated, would amount to over 14,000 tons, which at a cost of say $1.50 per ton would be $21,000.

On a railroad actually operating this number of locomotives the difference in coal consumption between July and January recently was actually 12,699 tons excess for January as compared with July, which, at the cost stated per ton, did amount to over $19,000, and there was an average decrease in cars hauled of .59 car per passenger train, and 1.89 cars per freight train, as compared with July.

Although it may be easier to indulge in a diagnostic of the disease than to name a remedy, we believe much can be done to mitigate the severity of the conditions described and to improve on present practice. It is not uncommon for locomotives to be supplied with, and cars oiled with lubricating oil in winter that cannot be poured from the spout of a can at 30 degrees Fahr., and that at temperatures below zero, as we often have, can be cut with a knife like butter. Knowing that it is the friction of the congealed lubricating oil that mainly causes the greater train resistance of winter, and all its attendant trouble and expense, it must be plain that greater attention should be bestowed upon the *consistency* of oil used for lubricating purposes with regard to the *temperature* at which it is to do its work.

Ordinary lubricating oils can be diluted with lighter oils, kerosene for instance, to any degree of consistency desirable, even when in contact with an ice cold surface; and it is desirable to have a liquid consistency of the lubricant when possible. Pure kerosene is declared by eminent authority to be a better lubricant for an ice cold surface than the best sperm oil. As it is cheap, it would appear then that its liberal use in diluting car and engine oils in cold weather as nearly sufficient as may be found practicable in service to maintain liquidity would greatly mitigate the vast trouble and expense of the increased resistance of trains in winter, for we may be assured that with no more friction in the journal boxes in winter than in summer, with clean or only frosty rails, locomotives can pull "summer trains" all the year round.

LOCOMOTIVE BOILERS.

The discussion of the subject of the construction of locomotive boilers is one that is always full of interest to those who are connected with locomotive building, maintenance or operating. The boiler being the mainspring of the engine, so to speak, the generator and reservoir of its power, the efficiency and economy of the engine depend upon it more than upon any other feature of construction. Given a liberally large boiler with ample water and steam space, and heating surface and grate area to correspond, and there can be no question as to the engine being a good and economical one, or capable of being easily made so, whereas a boiler frugal in the resources named is the end of all frugality in operating and maintenance expenses, and the irremediable cause of unceasing defeat to the engine on the road.

That this is generally pretty well recognized is evident from the way locomotive boilers have been continually increased in size during the past 15 years. It is the feature in which locomotives have been most improved during that time, and it is erroneous to think that the limits of improvement have yet been reached.

In this issue we present nearly in full two very interesting papers read upon this subject at the last meeting of the New England Railroad Club by Messrs. J. L. Spiers and F. W. Dean. Among the many good points brought out in both papers we desire to draw special attention to that in Mr. Spiers' paper where, in discussing the relative merits of crownbars and radial stays, he says:

"Another point of excellence [of the radial stayed boiler] is in the increased water holding capacity, a large part of which is in the solid body over the crown.

"In actual figures, taking as before a boiler designed for an 18 × 24-inch engine, in a space of 7 inches above and immediately over the crown, the boiler with crownbars will have 83 gallons of water; without crownbars or other incumbrance, the amount in the same space would be 136 gallons—39 per cent. of the water-holding space lost, and what remains is so cut up that with a hot fire the water must be tortured to froth in its effort to send steam to the space above.

"The radial stays for an equal distance above the crown displace but four gallons of water; this leaves a difference of 49 gallons in its favor. Nor is this the total gain in water around the firebox. On either side, starting from the center on top, the crown curves downward to such an extent that here a gain is made of 41 gallons, or 91 gallons in all around the box. The crown of the radial stayed boiler we are comparing has its crown raised three inches higher than the other, and has an extended wagon top, and contains when filled to second gauge, 1,427 gallons. The boiler with bars contains 1,048, or 378 less. Too much importance cannot be attached to this feature, as this extra amount of highly heated water ready to flash into steam will, when increased power is required, act as a reserved force."

It is too seldom that anything is said about the value of water space in boilers. Remarks on the advantage of large steam space are common enough, but it seems that many who appreciate the importance of steam space regard water space as of small or secondary importance. In locomotive service with the wide variation in the amount of work required of the engine from running shut off down hills or into stations, to struggling up hills or into speed from stops, there would be an equally wide variation in the rate of combustion to furnish the heat as used, if it were not for the water space in the boiler that may be utilized to store the heat given off by the fire when in excess of what is needed for the production of steam being used. This reserved power, which is stored heat in the shape of a quantity of water heated to the boiling point under high

pressure, may be utilized when the engine is doing hard work to lower the rate of combustion necessary to maintain the steam pressure. Thus the water space becomes a reservoir for the storage of power to be drawn upon during hard work and to be replenished during easy work or no work, for the purpose of equalizing the necessary rate of combustion. The larger the water space, the greater is the means it affords to accomplish this desirable result.

One matter mentioned in both the papers referred to and in the discussion of them was the infrequency of locomotive boiler explosions. There were three locomotive boiler explosions in January, one in a collision in which the boiler was probably ruptured, and two unexplained.

AUTOMATIC COUPLERS.

There have been two bills recently introduced in the United States Senate relative to the enactment of laws to compel railroad companies to equip all freight cars engaged in interstate commerce with automatic couplers, and all freight engines with driving wheel brakes.

One bill proposes such an impracticable method of accomplishing its object—voting for a choice of couplers by the railway companies, and organized railway employés—that nothing is likely to come of it. Another and later bill proposes that after Jan. 1, 1897, roads subject to the Interstate Commerce law must not haul any freight car engaged in interstate commerce, unless it be equipped with automatic couplers which will couple and uncouple without the necessity of a person going between the cars. After the same date, it will be unlawful to haul cars so engaged, unless they be equipped with a form of brake that can be applied and released from the locomotive hauling the train. Also, according to the provisions of this bill, driving wheel brakes must be provided on all freight engines after Jan. 1, 1893.

As the President has again recommended that Congress should take some action in regard to this matter, and as there has been so much agitation of it recently, it is well to face the probability of some such law as that outlined above being enacted. It will but hasten what eventually all railroad companies would find necessary to do to expedite the movement of traffic, prevent accidents and increase the general efficiency and earning powers of their roads; and it will save the many thousands of casualties to employés that would happen during the slow voluntary adoption of the safety devices, the suffering, sorrow and evils resulting from which would be immeasurable.

Many of the leading roads of the country have already taken this view of the matter, and, equipping or having equipped their cars with automatic couplers and brakes, are anxious that connecting roads shall do likewise in order to facilitate the interchange, handling and repair of cars.

The report of the statistician of the Interstate Commerce Commission, which has just appeared, properly devotes much space to the subject of railroad casualties. The total number of persons reported killed on the railroads of the United States during the year ending June 30, 1890, was 6,334, of whom 2,451 were employés, 286 were passengers and 3,597 were classed as "other persons," the last class including suicides. The total number reported injured was 29,025, of whom 22,394 were employés, 2,425 were passengers and 4,206 were unclassified.

During the year 369 employés were killed and 7,842 injured in coupling and uncoupling cars. There can be no doubt that a large proportion of these fatalities and injuries would not have occurred if automatic couplers had been in universal use.

Fewer passengers but more employés suffered injury than in the previous year, and this fact suggests to many the belief that railroad companies, while constantly endeavoring to promote the safety of passengers, show no solicitude for the safety of employés.

But it is more than likely that the increase in the number of casualties to employés for the year mentioned was largely occasioned by the lack of uniformity in couplers which was, is yet, and will continue to be a necessary evil of the transition period. Legislation that will hasten the termination of that period, if it be reasonable in its provisions, and practicable in its application, will result in general good to all concerned.

FLAME.

In the article describing different methods of removing old paint from passenger cars, appearing in this issue, the author advocates the use of a flame produced by a jet of gas and air previously intermingled under pressure before reaching the orifice of the burner. It is the principle of the blow-pipe, the intense heat of the flame being due to the presence within its body of sufficient oxygen to effect immediate combustion.

Ordinarily the structure of flame does not permit of combustion except upon the outside surface, the air in contact with it being unable to penetrate the body where there is gas that can not burn for want of oxygen. This causes length of flame, for time is necessary to enable the gas to finally meet with its equivalent of oxygen; and when this equivalent is not met with, while yet within sufficiently close juxtaposition to the main body of combustion, the union fails for lack of a sufficiently high temperature and the gas passes away unconsumed as smoke.

Any arrangement, such as the one advocated by the author of the paper, that will intensify the combustion and focalize the heat at the point where it is to be used, will certainly prove efficient and economical.

Labor Difficulties.

An unusual number of labor difficulties have disturbed the relations between railway employers and employés during the past month. A strike of trainmen and telegraph operators was in progress on the San Antonio & Aransas Pass when the month came in, and, although things looked hopeful for the company on the first day of the month, as they were on that day able to partially resume the movement of trains that had been abandoned several days, yet it was the 20th of the month before affairs began to assume their normal aspect.

This strike was accompanied by deplorable violence on the part of the strikers and their sympathizers. A party of 44 trainmen and telegraph operators, who were on the way to take the places of the striking men, were ejected from a car on the St. Louis, Iron Mountain & Southern, at Argenta, Ark., on Jan. 1, by a mob of railroad employés. The car in which the men were was cut from the train, and the men were driven into the swamps. The car was again coupled to the train, but at Little Rock, a mile farther, another mob took possession and with knives cut to pieces all the baggage of the non-union men. On the night of Jan. 4 strikers overpowered the watchman at Yoakum and dismantled 15 locomotives. There was other violence, and strong guards were placed on some of the passenger trains that were run by new men.

Just before Christmas the messengers of the Southern Express Company took advantage of the certainty of a heavy express business during the holidays to demand an increase in wages. It was granted; but after the rush was over wages were reduced to the old basis, and the messenger who presented the petition for the increase was discharged. A strike followed and spread to all of the company's lines from Pittsburgh to New Orleans.

There was a threatened strike of telegraph operators on the East Tennessee, Virginia & Georgia road, because, it appears, members of the operators' union were discriminated against. The affair was settled, however, by the railroad officials signing a written agreement that no member of the order shall be discriminated against on account of his membership.

The engineers and firemen of the New York, New Haven & Hartford applied through their committees for a new schedule of pay. After matters had become pretty well strained, and an agreement to disagree looked imminent, concessions were made by both sides, and an amicable settlement reached.

Engineering, in telling of the business outlook in England for the new year, and the prospects of working men, says: "The demand for labor has lessened, overtime has in many cases ceased where for a long time past it was systematically worked, and where it has not ceased altogether it has very much decreased, by the exercise of no virtue on either side. The list of unemployed is extending in nearly all trades, and present contracts are being completed without a sufficient weight of new orders to replace them. Then there are complaints of the cost of labor and materials, and indications are not uncommon of either a further slackening off in production or a reduction in wages, so as to encourage manufacturers to increase their stocks."

With the abundant crops in this country and the extraordinary activity of the railroads it appears that 1892 will be a year of prosperity here. The official estimate of the Agricultural Department is that the yield of wheat alone is nearly or quite 600,000,000 bushels, or 200,000,000 more than that of 1890, and that the corn crop is not less than 2,000,000,000 bushels. Nearly all other crops are correspondingly abundant, and those which are not so large in quantity are greater than usual in value.

There can be no more reliable indications of national prosperity, for such harvests, and a demand for them, is to commerce what steam is to an engine. They give impetus to all the wheels of industry and distribute wealth to all who are actively employed.

The Chicago, Milwaukee & St. Paul Railway have completed the construction of two models of their standard postal cars made for the German government. They were constructed at the West Milwaukee shops, on the scale of two inches to the foot, and are now on exhibition in the Chicago offices of the company. The cars cost about $1,000 apiece, present a very neat appearance, every detail having been finished in a complete manner, and have attracted a good deal of attention.

Another outrage committed upon an English railway train is reported. A woman occupying the same compartment with a local preacher was engaged in conversation after they had ridden some distance together, and after a time he insulted her. She repulsed him, whereupon he grasped her by the throat, preventing her from making an outcry, and then forced her down on the seat. Owing to the construction of English railway carriages, it was impossible for the other passengers or the guards to know what was going on in the compartment. After a struggle she was pushed out of the compartment and fell from the swiftly moving train. The woman is now recovering and her assailant has been arrested. But better than tender nursing, and better than the severe punishment of such criminals, would be a change in car construction that would not be a standing invitation to crime.

LITERARY NOTICES.

MACHINERY PATTERN MAKING. By P. L. Dingey. 12mo, cloth, $2. John Wiley & Sons, 53 East Tenth street, New York.

This practical book for pattern makers, written by a practical pattern maker, has for its object not the teaching of pattern making but the discussion of methods. This is done clearly and concisely, and good reasons are given for the methods advocated. Valuable advice is given of a character that if followed will tend to economize in time, labor and mental worry, and to prevent mistakes, for, as the author says, "cast iron mistakes are rather serious things." Most of the matter in this book was written for the *American Machinist*, but the author has revised many of the drawings and much of the matter, adding some valuable items.

The book contains 128 full sized different profiles of gear teeth from 1 inch to 3 inch pitch, suitable for gears having from 14 to 800 teeth. Also about a dozen handy tables referring to weight of cast iron pipe and balls; round, square and flat cast iron; binary and decimal fractions; metric measure reduced to inches, etc., etc. Also full page plate engravings illustrating manner of constructing numerous and important patterns and core boxes.

The "Proceedings" of the twenty-second annual convention of the Master Car and Locomotive Painters' Association is at hand. It is bound in cloth, and contains 57 pages of interesting matter pertaining to methods of car and locomotive painting.

A "Pocket Companion," issued by Messrs. Carnegie, Phipps & Co., has been received. It contains useful information and tables pertaining to the use of wrought iron and steel, strength of metals and alloys, timber and stone, weights of substances, linear expansion of substances by heat, and many other handy tables. It has 280 pages, gilt edges, bound in leather, and is about as neat and useful a pocket or pigeon hole companion as could be desired.

"Construction and Use of Milling Machines," Revised Edition, 162 pages, gilt title, blue cloth binding. By the Brown & Sharpe Manufacturing Company. The publishers of this book say that their object in writing the book was to assist those not familiar with the construction or use of milling machines. "We desire to aid in having the machines well understood, properly cared for and profitably operated." Milling machines are fast coming into favor for doing certain kinds of work formerly done on lathes and planers because the work can be done better, quicker and cheaper. Information in regard to the kinds of work these machines are capable of performing is much needed by many using them, and this book is well adapted to supply the need.

Books Received.

Statistics of Railways of the United States.

Annual Report of the State Railroad Commission of Michigan.

Fifth Annual Report of the Interstate Commerce Commission.

Annual Report of the Postmaster General for the fiscal year ending June 30, 1891.

Transactions of the American Society of Mechanical Engineers, Vol. XII., 1891.

At their meeting in Charleston on July 3, 1831, the directors of the South Carolina Railroad adopted and promulgated the following:

Resolved, That in future not over 25 passengers shall be allowed to go on each car, and that a locomotive shall not travel at greater speed when there is attached: One car and passengers, at 15 miles an hour; two cars and passengers, at 12 miles an hour; three cars and passengers, at 10 miles an hour.

We can make better time nowadays, because we have improved locomotives, track, roadbed and devices for making fast travel safe. But a railroad company which will not adopt these devices while it runs trains at high speed is justly condemned as reckless.

The Chicago & South Side Rapid Transit Railroad Company is now pushing the "Alley" elevated road to completion. The money has all been subscribed to complete the road to Thirty-ninth street, together with all the equipment. It is expected that this section of the road will be in operation by April 1. The cars are to be steam heated and equipped with the Pintsch gas system of lighting; and the locomotives, 20 of which have been ordered of the Baldwin Locomotive Works, are to be compounds of the four-cylinder type, and different in many details from the Manhattan Elevated engines. The boilers will be radial stay, wagon top, and it is expected that there will be little or no sound from the exhaust, and no cinders will be thrown from the stack. The engines are to have wrought iron frames, wrought iron driving wheels, wrought iron pistons, cast steel crossheads, steel axles and crank pins, phosphor bronze driving boxes, steel cabs, steel drawbars, and will be built under a guaranty for performance.

Communications.

Editor National Car and Locomotive Builder:

In the January number of the NATIONAL CAR AND LOCOMOTIVE BUILDER there is a communication from G. Bailey on staybolts.

In this article he does not ask for little space, or your kind indulgence, for his crude manner of expressing what he believes to be his theory of the forces working inside of locomotive boilers when in service, and resulting in the explosions of what he terms practically new engines.

This disastrous condition he firmly believes is chargeable principally to ignorant engine drivers, adding that the consequences are happily confined to those who have not been frightened into the right practice by your correspondent.

Whether Mr. Bailey has much reason to thank us for undertaking to expose this rank injustice to such an intelligent and brave body of men, as are our locomotive engineers in the United States, the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER will be inclined to doubt.

Great as your correspondent may believe himself to be, he has, we think, shown an undue confidence in his talents. He should have considered how dangerous it is for any man to attack or to defend a question without understanding it. And we feel convinced that he would not have written the article before us if he had, before he began, perused ours with attention.

He has utterly mistaken our object and meaning. He seems to think that we have undertaken to set up some new theory on the construction and management of locomotive boilers, in opposition to the Master Mechanics' practice, who, Mr. Bailey says, exactly know how much strain boilers and staybolts are able to stand.

We affirm that this statement is not correct, and that your correspondent does not understand what he is writing about.

He would be more at home on the foot plate, for most certainly he is out of his proper relations, writing on boiler construction and management.

He states that the sudden stopping of locomotive engines on a dark night by powerful airbrakes in the hands of ignorant enginedrivers, forces the water to the frontheaad with terrific force, then, reacting to the backhead, away goes the staybolts. How does it happen that the direct action of the water against the fronthead leaves it uninjured and that the reaction, which is spent force, breaks the staybolts in the side sheets below the line of the bottom of the front shell of the boiler?

It must be apparent to mechanical minds that the water to be forced in the way described by your correspondent must go through the forms of two right angles. This is what I termed in my former communication an entire mistake and will now add, unmitigated nonsense.

It is not correct to say that the steam is all forced to the backhead when the engine is suddenly stopped, or that the water is forced by reaction after stopping. In my former communication I stated that it was my experience that if staybolts were put in properly in size and tightness there would be very little trouble from broken bolts.

Your correspondent talks of the heads of staybolts pulling through the sheets. If he can frighten those who put heads on staybolts, to stop that bad practice, he will do much more good than what he claims to have accomplished with the ignorant enginedrivers. The staybolt that is hammered to form a head is no good; its cohesion is destroyed There is another matter connected with hammering—it is that the sides of the fire box are impinged, or pulled inward, resulting in cracks from one staybolt hole to another.

Referring to the practice of drilling the ends of staybolts for pointing out breakage, I am much in favor of using the hollow staybolt, as it has a double advantage over the solid drilled bolt. First, it is made stronger by being rolled inside and outside at the same operation. Second, it possesses uniformity by having the hole extend entirely through its length. In my judgment these advantages are of first importance.

The solid bolt is made better on the outer surface than in the middle, and drilling the ends under such conditions should not be done.

It seems at first thought that a solid staybolt, say one inch in diameter, must be stronger than a hollow bolt of same diameter, yet the contrary I believe to be the fact. That is, the hollow bolt is the strongest for the reasons above noted.

In closing, will say that your correspondent's declamation, in praise of himself, is a style common to those of his kind, and one which I will not contend with him.

J. T. CONNELLY.

Straight or Joint Inspection.

Editor National Car and Locomotive Builder:

I see by your last number of the NATIONAL CAR AND LOCOMOTIVE BUILDER that joint inspection comes in for a large amount of adverse criticism at the November meeting of the New England or Cape Cod Club. In the first place, let us consider why joint inspection was adopted. There is no doubt in my mind but that it was a last resort at the time and place it was first adopted; there is no company or head of department but what thinks he can just manage his own affairs without any dictation from any other company or companies; but the intricacies of the interchange business are such that no two companies can agree upon what each would consider a fair and equitable basis to work upon. Let us consider a case in point. A car is refused for any certain defect which is considered close by the delivering company, yet, at the same time, may be necessary. The receiving inspector says we will use this as a criterion for all future decisions. Now, while the defect in this case made it necessary for repairs, in another car of different build a like defect would be unnecessary, and there is where the argument comes in under the régime of straight inspection; each decision is a ruling to govern all future cases the multiplicity of which makes trouble; and when the foreman, seeing breakers ahead, goes to his superiors and represents (and I might say fairly) in his own mind the number of defects which are refused by a connecting road, and the superintendent says "All we can do is hold the same against them," and the foreman goes away satisfied, saying to himself "We will wind those fellows up in just about a week," the consequence is that matters grow worse until the superiors have to take hold and come to a new understanding and end the blockade, allowing cars to go forward that should have been at their destination. Then everything is lovely again for awhile until disagreements commence and the same scene is enacted over again. It is simply impossible for two companies having a large number of cars to interchange for both to feel satisfied with decisions rendered on all occasions. It is a fact that a defect always looks a little worse to the receiving company than it does to the delivering. Under these circumstances what is more natural than to appoint an arbitrator or joint man to do the business for all? It is not a new departure. Disputed questions of National importance are settled in this way. If a precedent has been established by the highest authority, why is it wrong to use the same in the lower and more practical walks of life?

I believe that the system is based on a fair and equitable plan, one that will save thousands of dollars to the companies interested, when carried out properly, in the prompt dispatch of freight and unnecessary transfers. That success depends on the joint man being competent and adapted for the business is without question, and the different companies should come to an agreement on a basis fair to all so that no orders should be given that effects all concerned unless given jointly under these circumstances. If the interchange is not facilitated then it must reflect on the joint man.

Another question that was raised at the New England Club was the integrity of the joint man. Now if any one will explain wherein it would benefit him to be dishonest in his decisions between two companies I would like to hear him. Even should any company intimate that it was their desire for him to do so, which I do not believe has ever been done, they would not or could not shield him when in difficulty. Leaving principle out of the question, he has everything to lose and nothing to gain; his duty *must* be apparent to himself, that each decision should be made as if superiors of both companies were on the spot; then, if called upon he can give a clear explanation why he came to such conclusion.

J. C.

Uniformity in Car Construction.

Editor National Car and Locomotive Builder:

I note the arguments of Mr Peck of the Western Railway Club and Mr. Marden of the New England Club for uniformity of car construction from the "repair" standpoint. I desire to add to their arguments in favor of uniform or standard construction for economy in "new" construction from a lumberman's standpoint. We saw millions of feet of car sills of yellow pine annually, and it is entirely on orders wanted in 30 to 60 days. The trees are standing in the woods, and after we get the orders we cut them, and within 60 days the lumber is in cars. The only chance the material gets to season is after it is in the cars. This causes more necessity for repairs than if seasoned material were used in new construction. If we had standard sizes of lumber to be used we would carry four or five million feet in pile and ship only seasoned lumber. Builders could thus use seasoned material and thus many loosened nuts and bolts which jar off and cause other breakdowns would be prevented. I examined a car recently with a master car builder. This car was new, only six months out of a shop. The quality of material was all good, but being green when used the shrinkage loosened up bolts and nuts, which fell off, caused a dropping of truss rods, and entire weight of contents was on one sill. Hence the necessity of repairs to this car was due to want of seasoned material, which can only be had by "standard" sizes. If standard sizes would be adopted, millmen could fill orders so quickly that necessity of railroads carrying in stock large piles of lumber would be obviated and millmen would carry stocks of seasoned car material.

The Lake Shore Railroad have recently contracted with us for several million feet of Georgia pine car sills, which we pile at our mills to be shipped when seasoned; thus they will use only seasoned material in their cars, and I believe it will pay them well in longer life of cars and less repair account.

By all means let's have uniform construction and standard sizes of lumber for cars. Yours truly,

ATLANTA LUMBER COMPANY,
M. F. AMOROUS, G. M.

Steel Tired Wheels.

Editor National Car and Locomotive Builder:

We have been interested spectators of the warfare that has been carried on in your columns of late between Mr. P. H. Griffin, president of the New York Car Wheel Works, and Mr. F. W. Coolbaugh, of the Boies Steel Wheel Company; and while we have no desire to interfere between these two gentlemen, yet there have been brought out two or three facts by this correspondence that may be of general interest, and we trust that Messrs. Griffin and Coolbaugh will pardon us if we take this opportunity to call attention to them. In Mr. Griffin's letter published in the January number of the NATIONAL CAR AND LOCOMOTIVE BUILDER he makes use of a statement showing the number of steel tires that have broken on railroads of the German Empire in 1884 to 1889 inclusive, which statement we presume is accurate so far as it goes. From this statement we gather that the German railroads have been experimenting with tires made of all sorts of steel, some of which are entirely unknown on this side of the water, and that a large proportion of the tires used on the German roads have been made of the cheapest material that could be found, and the result of this has apparently been disastrous as usual. If this German statement does or does not prove that cast iron car wheels are better than steel tire wheels it certainly does prove several things very conclusively:

FIRST—That tires made of open hearth steel are beyond all comparison the best that have been used there. SECOND—That crucible tires are rapidly going out of use in Germany. THIRD—That tires made of Bessemer steel are unreliable, dangerous and in the end costly.

The percentages of breakages, according to this statement, for six years are as follows: Bessemer tires, 33 per cent. Crucible tires, 21per cent. Open nearth tires, 11 per cent.

It is also shown that in 1884 there were 106,838 crucible tires in use in Germany, against but 53,922 open hearth; while in 1889 there were but 64,369 crucible tires in use, as against 284,815 open hearth. The Midvale Steel Company has always maintained that tires made from open hearth steel were superior to those made from crucible steel, although in doing so we have run counter to the opinions of a good many railroad men in the United States who seem to think that crucible tires are the best. We feel a considerable degree of satisfaction in having our views confirmed by an offical statement of the German Government, and particularly so as German crucible tires have always been held up to American tire manufacturers as models. We wish that the statement of breakages could have gone a step further, and had given the number of breakages of the different makes of tires and the causes which led to the breakages, as far as known. We would also like to have known how many of the tires broke in service, and the thickness at the time of breakage. How many tires, for instance, had been worn down below the point of safety, and how many broke because the proper allowance for shrinkage had not been made. We would like to have known how many of the broken tires were made by concerns that are steel makers, and how many by concerns that are tire makers but not steel makers. Such a statement as this would be very interesting indeed. There are plenty of tire makers in Germany who are not makers of steel, as there are in this country—amateurs, so to speak—and in the nature of things tires made by such concerns are liable to be non-uniform in quality. We have no doubt that if all the facts were obtainable it would be shown that the amateur is responsible for the largest proportion of the breakages.

The railroads and the traveling public of the United States are to be congratulated upon the fact that no such showing of broken tires has ever been made in this country. That so few tires of American make have broken is due, we believe, largely to the fact that the bulk of the tires made here are furnished by tire makers who are also makers of steel, and that but very few tires have been made here of Bessemer steel. There is no Bessemer tire plant in the United States, but Bessemer blooms have been used by tire makers, who buy their steel in the open market.

Very truly yours,

THE MIDVALE STEEL CO., by
CHAS. J. HANAH, President.

[Herewith is given some further information contained in the communication from the president of the Bureau of Railroads of the German Empire, referred to by Mr. Griffin in the communication on "Safety of Chilled Car Wheels," in the January NATIONAL CAR AND LOCOMOTIVE BUILDER. —Editor.]

STATEMENT OF CAUSES OF BREAKAGES OF STEEL TIRED WHEELS ON GERMAN GOVERNMENT RAILROADS.

Year.	Number of steel ties on hand and in use.	Per cent. broken.	Per cent. broken in consequence of			
			Brittleness of material	Defective material.	Defective welding.	Effect of brakes, temperature, collision, old fractures etc.
1884.....	941,915	0.30	.025	.15	.024	.10
1885.....	959,682	0.37	.033	.17	.013	.15
1886.....	992,636	0.40	.036	.15	.014	.20
1887.....	1,007,996	0.29	.041	.11	.006	.13
1888.....	1,041,135	0.37	.065	.12	.005	.18
1889.....	1,102,941	0.31	.063	.10	.002	.114

Editor National Car and Locomotive Builder:

We read with considerable interest the article by Geo. L. Fowler upon strength of truck bolster. This is a step in the right direction. We have got ultimate strength of truck bolster. Why will not this gentleman still continue the work and give us strength of body bolster? Then following, give the longitudinal strength of cars, as they now exist. We are all after the strongest car, and, leaving out the question of details, the right places for us to begin are bolsters and sills. A. DOLBEER, Supt. Motive Power,

Buffalo, Rochester & Pittsburgh Ry.

[In the NATIONAL CAR AND LOCOMOTIVE BUILDER for March we expect to present some further interesting information in regard to this matter.—EDITOR.]

Strength of Track Bolsters.

Editor National Car and Locomotive Builder:

The following are the details of the tests to which the standard truck bolster for 60,000 pounds capacity cars on the Chicago & Northwestern Railway were subjected. Under 33,000 pounds pressure applied, which is the normal load, there was a deflection of one-sixteenth inch. This deflection under the pressure was attributed to the settling of the plates and the wooden framing until all could have a bearing. Under 50,000 lbs. pressure applied there was a deflection of three thirty-seconds inch, and under 75,000 pounds pressure applied a deflection of scant one-eighth inch.

No pressure was applied after this figure had been reached, and on the releasing of the same it was found that there was not a particle of permanent set, even after the bolster had been under pressure for some length of time. In view of the fact that the normal load is about 33,000 pounds, it is considered that the bolster has ample strength for sustaining its load.

The test was made as near as it was possible to make it to the conditions as they prevail in actual service. Three pieces of steel rail were laid across the bed of an Olsen physical testing machine, on which was set the bolster springs of the car, each having 40,000 pounds capacity. On these springs the bolster was placed, and the pressure applied to the center plate. A straight edge was supported along the edge of the bolster by nails driven into the end and the amount of deflection was measured at the straight edge under the different pressures applied.

GEO. L. FOWLER.

The following is taken from a recent Australian exchange:

During the past few days somewhat ominous rumors have been current concerning the Baldwin engines recently imported from America by the New South Wales Railway Commissioners. Questioned on this matter by the representative of the Sydney *Morning Herald*, the commissioners made the following statement: "It is true the Baldwin engines have been running hot, and several breakages have occurred. The engines have been run on express trains, and as a consequence they have been put to a severe test and the conclusion arrived at is that the axles on the bogies are too small for the speed. In every other respect these engines have been doing splendid work. Their hauling and steaming power is equal to all that could be expected; and they have been doing far better work than any engines on the New South Wales railways. This one defect has, however, been developed. It is a somewhat serious one, and to prevent accident we have suspended the use of all of them on the fastest trains. We have been running them at an average speed of 34 miles, which is more than the bogie wheels can stand without heating and consequent damage to the axles. Alterations will be made in the whole of the 12 engines. These locomotives have been doing 65 per cent. more work than any we have on the system, and we are perfectly satisfied with them, excepting, of course, the weakness developed in this one particular. It may be said that the introduction of these engines was to a great extent experimental, and it was not too unreasonable to expect some defect in their early working, but the fact is, we have been running them at a higher rate of speed than they were built for. There is nothing at all to fear about the engines proving failures. Three of the twelve have developed this weakness and we have determined to replace the bogie axles in the whole with heavier steel axles."

Messrs. Burnham, Williams & Co., have written to us in regard to the above, saying: "The statement of the Railway Commissioners that the locomotives are efficient and satisfactory in all respects, except the heating of a few engine truck bearings, is correct. Our engineer reports that the locomotives are easily performing the work intended; that they are popular with the engine men; and that but for the heating of boxes no criticism could have been raised.

"The heating of the engine truck boxes is probably due to the fact that the truck wheels are of smaller diameter than is usual in locomotives of European construction, and therefore, a somewhat greater degree of care should be given to the bearings. It is well known, however, that 30-in. truck wheels, with 5x10 journals, are usual in high speed locomotives in this country. The weight on the trucks is 28,000 pounds. Our engineer informs us that the engines are so well counterbalanced, steam so freely and run so smoothly, that even less care was given to them than is usually required when a new engine is put into service, and, therefo e, being accustomed to larger truck wheels, insufficient attention was given to the truck bearings. Consequently, some of the axles were excessively heated, and in the effort to bring one of the engines in without loss of time, one was heated so that it broke a few moments after the engine was uncoupled from the train."

The Pennsylvania & Northwestern Railroad has ordered ten consolidation locomotives of the Baldwin Locomotive Works. Four are to be of the Vanclain compound pattern.

Collisions.

Collisions have been the order of the day during the past two months on the railroads all over the country—on the big roads and the little ones; in the East and the West; on roads famous for careful management, and on others where slipshod methods prevail. Collisions that could have been prevented by a proper system of block signals, and others that no system of signals could have saved. Head end and rear end and side collisions. A general reign of Smash.

The accompanying engraving shows a collision between two passenger trains that recently smashed into each others in broad daylight. The sum of the speeds of both trains at the moment of collision was close to 50 miles an hour. Both engines were pretty well demolished, and the mail car telescoped the baggage and express car. One of the engineers, in a fit of forgetfulness, had passed the meeting point. We may regard this collision as simply a destruction of property, for, miraculously, there was no one killed in it or very seriously injured. The enginemen saved themselves by jumping. The engineer at fault did not wait to see how many were killed, or if the passengers wanted to hang him, but, à la Herrick, made good his escape.

Another collision between two passenger trains in January that probably looked much like this occurred in the night and the fog, crushing the life out of six passengers and the two engineers, and destroying $40,000 worth of property. Again one of the engineers was at fault, for, leaning out of his cab window, lost in the fog, asleep, or dead from heart disease, as some suppose (no one will ever know which), he did not stop or slacken speed at the station where he was to meet another passenger train. Both trains met between the switches. The sum of the speeds of both trains was nearly the same (50 miles an hour), as in the case of the collision shown in the engraving. Neither of these disastrous collisions could have been prevented by any system of signals.

Many times every day the safety of every train and every railroad depends upon the faithfulness and careful judgment of some one man. If he fails to perform his duty properly at some critical moment, as any human being is liable to do, nothing but chance stands in the way of disaster. A train dispatcher may give lap orders, an engineer may forget himself or go to sleep, a flagman may be unfaithful to his trust, and the conditions for disaster are brought about. In some such cases the alertness of some other employé may prevent accident. The fireman man may prompt the engineer, some operator the dispatcher, but the lone flagman must depend upon himself.

In nearly every other matter pertaining to the movement of trains, employés have company in doing their work that may, and often do, correct lapses of carelessness on the part of each other in time to prevent trouble. It is this that makes it imperative that less dependence be placed in flagmen, and greater precautions taken to protect the rear of trains by signals watched by more than one man.

On the Northern of France Railway an important experiment is about to be tried on a large scale. All carriages even on short distance trains, are to be warmed, and the warmth is to be produced by means of boxes of acetate of soda. The chemical is put in a solid state into the boxes, and these are then plunged into hot water of about 100 degrees. The effect is that the soda becomes liquid. On being taken out of the water the boxes are wiped dry and put in carriages. By degrees the soda solidifies, and as long as that operation lasts—that is, for about five or six hours—it gradually gives off the heat it has absorbed in the melting process.

Railway Statistics.

There has just been issued from the statistician's office of the Interstate Commerce Commission the third annual report on the "Statistics of Railways in the United States." This report gives comprehensive statistics covering the operations of railways for the year ending June 30, 1890, and a statement of earnings from passenger and freight service, together with operating expenses and fixed charges, for the nine months ending March 31, 1891. Under railway equipment is included a statement of the rolling stock as it stood on June 30, 1890. Corresponding totals for the previous year are also given, from which the increase in equipment for the twelve months covered by the report may be discovered.

Cars.	Passenger service	Freight service.	Company's service	Fast freight line service	Total cars owned.	Cars leased.	Total.
Total 1890....	26,511	913,580	32,636	59,740	1,032,467	131,721	1,164,188
Total 1889....	25,665	854,031	31,657	49,766	934,246	134,309	1,068,555
Increase.	846	59,549	979	9,974	98,221	*2,588	95,633

Locomotives.	Passenger.	Freight.	Switching.	Total.
Total, 1890.	8,384	16,140	4,062	29,928
Total, 1889.....	8,079	15,140	4,016	29,036
Increase.....	305	1,000	46	892

It will be observed that the increase in locomotives is 892, which gives 15 locomotives for every 100 miles of new line brought into operation. The ratio for the total mileage of the country is 19 locomotives for every 100 miles of line, thus showing that the increase in equipment did not keep pace with the new mileage. This would naturally be expected, since the increase in mileage is in those parts of the country having relatively sparse equipment.

A COLLISION BETWEEN PASSENGER TRAINS.

Track mileage.	Single track.	Second track.	Third track.	Fourth track.	Yard track, sidings and spurs.	Total mileage operated (all tracks).
Total—Un'l'd S	156,404.06	8,437.65	760.88	561.81	33,711.38	199,875.78

CARS FITTED WITH TRAIN BRAKE.

	Passenger service	Fr'ight service	Company's service	Fast freight line service	Total cars owned.	Cars leased.	Total.
Total, 1890 .	25,330	78,475	1,921	3,074	108,800	19,411	128,211
Total, 1889..	23,540	66,513	1,965	1,457	77,432	32,732	110,164
Increase	1,790	11,962	*44	1,617	31,368	*13,291	18,077

CARS FITTED WITH AUTOMATIC COUPLERS.

	Passenger service.	Freight service.	Company's service.	Fast freight line service.	Total cars owned.	Cars leased.	Total.
Total, 1890	25,551	75,485	4 '3	3,324	104,783	9,581	114,364
Total, 1889.....	23,348	46,644	440	1,867	72,299	7,989	80,510
Increase.....	2,203	28,841	*17	1,457	32,484	1,592	33,854

The statistics of accidents contained in this report show that 531 employés were killed and 2,588 were injured during the last year by train accidents, and that 369 employés were killed and 7,842 were injured in coupling and uncoupling cars.

LOCOMOTIVES FITTED WITH AUTOMATIC

	Train Brakes.					*Couplers.*				
	Passenger.	Freight.	Switching.	Unclassified and leased.	Total		Passenger.	Freight.	Switching.	Total.
1890.	8,190	9,528	1,838	606	20,162	1890.	823	104	28	955
1889...	7,706	8,743	1,366	180	17,995	1889...	178	44	..	222
Inc'se.	484	785	472	426	2,167	Inc se.	645	60	28	733

*Decrease.

Spontaneous Combustion.

A theory recently presented by Prof. Vivian Lewis, in London, differs from that heretofore adopted in England, but it agrees with that of M. Fayol, engineer of the Commentry Coal Mines, which was submitted to the Mining Congress at Paris in 1878. He claims that coal possesses in a very high degree the property of condensing gases on its surface, in proportions which vary according to the nature of the coal, its state of division and its density.

Freshly mined coal has not a constant absorptive power, but it can retain at least 1.25 times its own volume of oxygen, and sometimes three times. This action, which is very rapid at first, becomes gradually reduced, and varies with the temperature. It is purely mechanical in its nature, is accompanied by the production of some heat, and depends upon the extent of the surface exposed. The oxygen when condensed in the pores of the coal will quickly combine with the carbon and hydrogen of the coal, which it converts into carbonic acid and vapor of water. The heating of the mass contributes to the quickness of this process and increases little by little; especially if this action takes place at a certain depth below the surface of the mass, it is easy to comprehend that fire may break out in the center of a pile or a cargo of coal without notice.

The experiments of Mr. Fayol prove that all coals exposed to the air absorb oxygen, and this absorption is always followed by a more or less sensible change in its composition.

Coal in large lumps does not heat even when it is piled up to a considerable height. Small or broken coal will take fire spontaneously when it is in a large pile. It seems to be a little less inflammable when it has been washed. The ordinary mixture of lumps and small coal which is generally called "run of mine" is about the same as washed coal. In dust or slack coal will take fire a little less easily than the run of the mine.

The heating is in almost direct relation with the height and the volume of the coal in the pile. If the pile is small the temperature will increase to a certain degree, depending upon circumstances, and will then remain stationary, and finally will slowly diminish. There is no record of a pile of less than 6 feet in height taking fire, and the temperature will seldom pass 120° Fah. On the other hand, when the height is over 14 feet spontaneous combustion is almost sure to come after a certain time.

The temperature increases gradually, and in the course of the third month some steam will be given off by the pile; then colorless, but strongly odorous gas, while some days afterward smoke will appear at a point at about half the height of the pile.

The best method of preserving coal from deteriortion consists in exposing it as little as possible to the air and keeping it at a low temperature. The absorption of the oxygen by the coal increases rapidly as the temperature rises, being about ten times as quick at 212° Fah., as at the ordinary temperature. Dampness prevents the heating rather than favors it, since washed coal when piled up in a damp state changes and heats less than before; but where the coal is in large lumps dampness may exercise an indirect action by breaking up these lumps and facilitating their reduction to dust. Coals are generally more inflammable, as they are lighter, more porous and richer in volatile matters. Coals having much pyrites change but little at the ordinary temperature, but the action is increased in damp air.

The above is an abstract from "Notes on Cumbustion," in the January *Railroad and Engineeering Journal*. Most substances have the power of burning in three ways, namely: By slow oxydation, when little or no light is evolved; by more rapid combination, when the burning becomes so hot as to render itself luminous, and by a still more energetic action when it bursts into flame.

We have an example of the first of these processes in the phenomena termed *eremacausis*, or slow burning, as is witnessed in the glowing of phosphorus, and in the luminosity of decaying wood or putrefying fish. In most of these cases the heat and light evolved at any given moment are not very considerable; but when it is understood that the total amount of heat, and, perhaps, also of light, generated during this slow kind of oxidation, is the same as that evolved during the most rapid combustion of the same substances, there is no difficulty in seeing that the phenomena in the two cases are referable to the same kind of chemical action, and belong to the same category.

When a log of wood is allowed to rot away under the influence of air and moisture it undergoes practically the same changes as if it had been rapidly consumed on a fire, and the same amount of heat is evolved. But while the log would be consumed by rapid combustion in a few hours, many years would be necessary for the completion of the action by the process of decay, so that the heat which in the one case can be noticed and utilized, in the other is dissipated and escapes detection. With substances capable of undergoing this process, it often happens that the accidental surroundings of the body with a bad conductor of heat will cause a rise in temperature, due to the slowly generated heat being unable to escape, and as rise of temperature aids all chemical action. the rapidity of the slow combustion increases until the temperature is reached at which the action makes itself manifest as rapid combustion.

Australian Railroad Criticism.

The *Railway and Tramway Review*, of Sidney, finds much to criticise in the railway practice of New South Wales Evidently the "burning question" of couplers and brakes is being much agitated there. Lately there have been several accidents caused by the tenders of engines pulling passenger trains backing up, jumping the track, causing serious damage and some loss of life.

After the usual delay and perfunctory inquiry, says the *Review*, the usual and unsatisfactory verdict has been returned "accidental death." Continuing: We look upon these coronial inquests and inquiries as, in most instances, mere matters of form, like bereaved persons wearing mourning, and of no value whatever. Here is an example of evidence (?) of a useless and misleading kind. "The engine was in good order to the best of his belief [locomotive superintendent]; he could not say when it was overhauled; knew of nothing being out of repair either in the engine or the train." The tender, which caused the accident, is not mentioned at all. Was that in good order? Here is more evidence (?) from England, of a similar character, if anything, worse. The coroner, a highly skilled physician himself, asked the question when inquiring into the Norton-Fitzwarren accident. The witness, an engine driver, said, "I should judge that the special train was going at the rate of 50 miles an hour." The Coroner: "Do you mean 50 miles per hour including stoppages? Witness: "No, that it was going 50 miles per hour when it struck my train. There was terrible devastation."

This is a specimen of the intelligent (?) way inquiries are conducted in this enlightened age. To save a few minutes or a shunt the management of some roads will incur terrible risks. When shall we do better?

Since writing the above another accident has happened. On the Lithgow Zig Zag a drawbar hook broke and allowed a portion of a goods train to run away. The Bathurst accident of last year repeated, to all intents and purposes, and it is specially pointed out by the departmental press that the side chains gave out, too, evidently seeking to compel the inference that they should not be used. But it is significant indeed that just as a deputation of employés, who daily see the dangers attendant on various improper practices, warned the commissioners some months before the Bathurst accident that just such an accident would inevitably incur sooner or later. So also, after careful consideration among themselves and comparing notes, a deputation of employés only a short time ago waited upon the locomotive engineer and pointed out the danger of running double trains, *i*, *e*., coupling together two train loads of vehicles and running them as one train, with two engines and breakvans. They predicted just as the others had done, that it was only a matter of time till some serious accident would happen from the cause named. Of course their representations were pooh-poohed and disregarded, and lo! in a few weeks this Zig Zag accident happens to a train, under the very circumstances complained of by the deputation, All draw gear, however strong, is only calculated to stand the strain of a single and proper train load, with the usual margin of safety added, and thus another preventable accident is added to the already long and fast lengthening list of similar occurrences from a dangerous practice which has been frequently pointed out and condemned.

These facts are, as usual, carefully ignored by the partial daily press, who delight, as the *S. M. Herald* editor once put it, "to support constituted authority." We might truthfully add—whether right or wrong.

If the center draw gear was properly designed and made, side-chains might be of little use, especially if screw couplings and a continuous brake were used—as they should be on all the rolling stock; such as has been the practice in the little colony of Tasmania, even since the narrow gauge was adopted in 1871. We seem to ignore timely warnings in this colony. From the year 1881 this draw gear and brake question has been "under consideration" by the department. The common-sense view of the whole case was, of course, to have adopted a continuous automatic brake on all the stock long ago, not confining ourselves to applying that gear to the passenger stock only. The draw gear could have been attended to next, but here there are so many "Cooks" the broth is certainly mixed up, if not spoiled. The special vote of £35,000, which is now being spent in new draw gear, is being unwisely spent. There can be no doubt about that, seeing that the so-called "new strong gear" is failing almost daily. We wonder whether the proper quality of iron has been used for this draw gear or whether some "cheap and nasty" stuff has been used in the interest (?) of economy (?)

A Swedish Railway Project One Hundred Years Ago.

Close upon forty years before Stephenson's victory, a Swedish engineer, Karl Högström by name, not only constructed a locomotive on similar lines to the one of Trevithick and Vivian, but also conceived the plan of a regular railroad. His first notion was that his locomotive should be used on ordinary roads, but soon realizing the insurmountable difficulties attending this style of locomotion, he, in the year 1791, brought out his railroad scheme. The rails were to be of cast iron and perfectly smooth, and in order to prevent derailment the wheels were to have a projecting edge. Convinced of the insufficiency of friction between the smooth wheels and rails for the propelling of heavy trains, Högström proposed that a tooth wheel on his locomotive should work on a central toothed bar or rail placed between the other rails—a plan which of late has been adopted in several instances where the gradient has been exceptional. Högström's plan was laid before several scientists, who were unanimous in denouncing it as utter madness, as it was absurd to imagine that a carriage could ever be propelled by steam alone. The plan was entirely shelved, and nothing more appears to be known as to the fate of Högström, who afterward went abroad.—*The Railway Engineer.*

The antipathy of workmen in Germany to piece work is growing stronger in many of the industrial districts. They complain that this mode of labor is more exhausting than ordinary labor, by the day, etc., particluarly to the nervous system of the workmen, in their long continued working upon the production of identical portions of machinery, needing repeated similar movements of the limbs.

January proved to be a very stormy month. Blizzards and snowstorms prevailed in the West and Middle States, and the East was not slighted. Temperatures lower than 40 degrees below zero were reported in many places. On the 19th, out of 23 mail trains due in Chicago in the morning from all points, 14 had up to noon failed to arrive, and not one of them was on time. The snow blockade was one of the most extensive the post-office officials remembered having experienced. The delayed trains were due from every point of the compass.

An amusing incident occurred at a recent dinner given in New York City by the members of the St. Nicholas Society. Chauncey M. Depew occupied a seat at the table of honor. The venerable weathercock, which in the days of its former owner performed its functions upon the barn of Washington Irving, was placed upon the table. There was a smile upon the face of the fowl as it faced Mr. Depew, and there was a broader smile on the other faces present when the remark was quietly dropped that birds of that breed always pointed in the direction whence the wind came.

For several years there has been talk of building a cable railroad up the Catskills, but nothing definite had been done until recently, when there was a meeting held in the offices of the Catskill Mountain Railway at Catskill, and the Otis Elevating Railway Company was organized to revive the scheme. The new road will be almost an elevator, as it will go up 1,700 feet in one and one-quarter miles. The start will be at a point on the Catskill Mountain Railroad between Palenville station and the Mountain House, and the end will be on a level with the Catskill Mountain House, an eighth of a mile away.

Jay Gould has the best system known. Under the carpet, about two inches to the right of where his left foot generally rests as he sits at his desk, is a slight protuberance. When Mr. Gould has a troublesome visitor call, one of the obnoxious class of every day bores, he silently presses the button once. A moment later a clerk appears with some story of "Mr. So-and-So desires to see you on most important business," and the visitor is politely got rid of. Three quick pressures on the button will bring Mr. Gould assistance in the shape of two burly men, well armed. Had the Sage crank called on Mr. Gould, that gentleman would have said, "certainly, I will write you a check," and while so doing he could unobserved have pressed the button. When the three rings are given the "helpers" are under instructions to enter without knocking and as quietly as possible. The only way to get ahead of Mr. Gould is to catch him away from his desk.

Railroads that are ordering new freight cars should not fail to have the quality—better still, the brand—of paint to be used strictly specified. One of the big western roads is now having deliveries of a large lot of box cars ordered this fall, and although the first cars delivered have not been out of the car works sixty days, the paint on them is already badly faded. The car building company evidently used the very cheapest stuff it could procure—the probability being that it compounded the mixture itself of the lowest priced materials which could be bought. We do not say that it committed any fraud in doing this. The railroad management probably neglected to guard this point in its specifications and the car building concern took advantage of its neglect. If it could send the cars out all sleek and shining and have them accepted, why should it not save half a dollar on each gallon of paint used by putting on its own mixture instead of some approved brand? But railroad managers should remember that car companies in bidding on specifications put the item at a figure which will cover a standard brand. If the railroad officials are smart enough to specify what shall be used the car builders can put on the quality named and still have a little margin; of course, if they are allowed to use what they please the margin will probably broaden considerably. But practically, it will not cost a cent more to have contract cars painted with paint that will stand wind and weather a reasonable time than it does to let them be daubed with a mixture which begins to grow pale and silently fade away as soon as the car gets out of the erecting shop.—*The Railway Master Mechanic.*

Personal.

Mr. E. W. Hays has been appointed master mechanic of the Ft. Worth & Denver City road.

Mr. John Haggard, postmaster-general of Canada, has been appointed minister of railroads.

Mr. W. P. Robinson has been appointed general manager of the St. Joseph & Grand Island.

Mr. Everett R. Reynolds has been appointed assistant to President Corbin, of the New York & New England.

Mr. L. L. Keller has been appointed superintendent of the Lexington & Southern division of the Missouri Pacific.

Mr. George C. Crocker, chairman of the board of railroad commissioners of Massachusetts, resigned, on Jan. 12.

Mr. Henry H. Horton has been appointed master mechanic of the Florida Midland, with headquarters at Kissimmee.

Mr. G. A. Coe has been appointed superintendent of the western division of the Chicago & Erie, with headquarters at Chicago.

Mr. George W. Gardiner, master mechanic of the Northern Pacific at Mandan, N. Dak., died on Jan. 20 after a short illness.

Mr. Joseph D. Greene has been appointed auditor of disbursements of the Pennsylvania road, succeeding the late Thos. R. Davis.

J. C. Conroe, recently appointed Master Mechanic of the Atchison, Topeka and Santa Fe, has had his headquarters placed at La Junta, Colo.

Mr. Isaac Barton, general superintendent of the Long Island Railroad, has resigned to become general manager of the New York & New England.

Mr. Stephen S. Cobb, who was the first State railroad commissioner of Michigan, receiving his appointment in 1873, died recently, aged 71 years.

Mr. E. P. Lord has been appointed superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis, vice Mr. F. P. Boatman, resigned.

Mr. E. S. Brown, general manager of the Rome, Watertown & Ogdensburg, has been given a leave of absence and will pass the winter in Southern California.

Mr. H. E. Gilpin, formerly roadmaster of the western division of the Erie, has been appointed superintendent of the Tioga division, in place of Mr. E. F. Kurbloe.

Mr. J. P. Hovey, general foreman of the B. & O. shops at Chicago, has resigned that position to take charge of the Oregon Short Line shops at Shoshone, Idaho.

Mr. Austin Corbin has been elected president of the New York & New England, succeeding Mr. J. A. Bostwick, who has been made chairman of the board of directors.

Mr. E. C. Bradley, superintendent of telegraph of the Pennsylvania lines west of Pittsburgh, has resigned to accept the position of general manager of the Postal Telegraph Company.

Mr. Isaac D. Barton, general superintendent of the Long Island Railroad, has resigned, having been appointed general manager of the New York & New England Railroad by President Corbin.

Mr. E. S. Marshall, formerly superintendent of motive power of the St. Louis, Arkansas & Texas, has been appointed superintendent of machinery of the Madison Car Company, Madison, Ill.

Mr. J. R. Reniff has been appointed master mechanic of the Toledo division of the Lake Shore & Michigan Southern, with headquarters at Norwalk, O., in place of Mr. B. F. Rumberger, resigned.

Mr. John M. Turner, formerly superintendent of the Louisiana division of the Illinois Central, succeeds Mr. J. H. Agnew as superintendent of the South Carolina, with headquarters at Charleston.

Mr. J. D. McIlwain, superintendent of car construction of the Grand Trunk at London, Ont., has resigned that position to take the general superintendency of the Harvey Steel Car Works at Chicago.

Mr. J. J. Burns, superintendent of telegraph of the Denver & Rio Grande, has been appointed superintendent of the first division, and will continue to perform the duties of superintendent of telegraph.

Mr. O. O. Winter, lately general superintendent of the Fort Worth & Denver City, has been appointed superintendent of the Minneapolis Terminal Railway and has entered upon the discharge of his duties.

Mr. N. W. Sample, superintendent of motive porer of the Denver & Rio Grande, has been appointed general superintendent of the road with jurisdiction over the transportation, machinery and roadway departments.

Gen. W. J. Sewell, ex-United States Senator, has been appointed second vice-president of the Baltimore & Potomac Railroad, and will have his headquarters in Washington, at the Baltimore & Potomac station.

Mr. John F. White, master mechanic of the Fort Worth & Denver City road, with headquarters at Fort Worth, Tex., has retired from that position. His successor is Mr. E. H. Hose, formerly with the Union Pacific at Beatrice, Neb.

Mr. B. Malloy, general foreman of the Chicago shops of the Wisconsin division of the Chicago & Northwestern, died on Jan. 11, from injuries received at Montrose about two weeks previously while engaged in the removal of a wreck.

Mr. Albert Langmoid, who was formerly master mechanic of the Northern of New Hampshire, in Concord, died at Pembroke, N. H., aged 75 years. He had been connected with the Northern road for nearly 30 years, and had made his home in Pembroke since 1879.

Mr. D. O. Smith has been appointed master mechanic of the Mobile & Ohio shops at Whistler, Ala. Mr. Smith was formerly foreman of the Louisville & Nashville roundhouse at Birmingham and learned his trade in the same shops that are now placed under his management.

Mr. C. F. Brotherton has been appointed superintendent of the Kansas City, Wyandotte & Northwestern Railway. Mr. G. Mertscheimer has been appointed master mechanic in charge of the motive power and mechanical department. Both officials will have their headquarters in Kansas City.

Mr. Louis H. Meyer, president of the Pittsburgh, Fort Wayne & Chicago, died at his home at Fort Wadsworth, N. Y., aged 76 years. He had been interested in transportation companies for many years, and was the senior member of the banking firm of L. H. Meyer & Co., of New York City.

President Harrison has reappointed Interstate Commerce Commissioner William R. Morrison, and has filled the two vacancies on the commission by appointing Judge James W. McDill, of Iowa, to succeed Judge Cooley, and Judge William M. Lindsay, of Kentucky, to succeed the late Walter L. Bragg.

General Superintendent J. V. Patton of the Pittsburgh & Western has been appointed general manager of the new Baltimore & Ohio system between Pittsburgh & Chicago Junction. This includes the Pittsburgh & Western, the Akron & Chicago Junction, the Valley and the Pittsburgh, Painesville & Fairport.

Mr. William Smith, superintendent of motive power of the Boston & Maine, died suddenly in Boston in January. Mr. Smith began his railroad career in 1849, when he was about 22 years old. For six years he was an engine dispatcher and for 23 years a locomotive engineer. He was appointed master mechanic in 1879, and a few years later superintendent of motive power. His entire railroad service was on the Boston & Maine.

Captain John Davis, a retired sea captain of Deer Isle Me., was one of the crew of 52 men who, serving without pay, sailed in the United States ship "Jamestown," Capt. R. B. Foster, in 1848, carrying flour and grain to the famine-stricken people of Ireland. Every one of the 52 men before the mast in the "Jamestown" had, previous to that voyage, been master or first officer of a ship. As far as can be learned, Captain Davis is the sole survivor of that famous crew.

After an illness of about two years Mr. A. G. Darwin died at his home at Glen Ridge, N. J., Jan. 22, aged 65 years. Mr. Darwin had been prominently connected with many railway enterprises. He was at one time president of the Allan Paper Car Wheel Company. He was president of the Strong Locomotive Company, and the San Juan Mining Company of Colorado, Treasurer of the Union Construction Company, and a director of the New York & Long Island Railway Company. He was also one of the directors of the Chicago Railway Exposition of 1883.

Mr. James Sedgeley died at Washington, D. C., Jan. 13, aged 67 years. Mr. Sedgeley was formerly a vice-president of the American Society of Master Mechanics, for many years master mechanic of the Northern New Hampshire at Concord, and later general master mechanic of the Michigan Southern & Northern Indiana. In 1870, upon the consolidation of the Lake Shore & Michigan Southern, he was appointed superintendent of motive power. Remaining in this position 14 years he was, in 1884, compelled to retire from active business in consequence of failing health.

Mr. P. P. Wright, for the past eleven years general superintendent of the Lake Shore & Michigan Southern, has been made general manager. Mr. W. H. Canniff, formerly assistant general superintendent, is his successor. Mr. P. S. Blodgett, superintendent of the Eastern division, becomes assistant general superintendent, with headquarters at Cleveland, Mr. Tracy W. Niles, formerly superintendent of the Franklin division, being transferred to Buffalo, to succeed Mr. Blodgett, and Mr. J. K. Russell, trainmaster of the Franklin division, succeeds Mr. Niles as superintendent of that division, with headquarters at Youngstown, O.

Mr. John B. Carson, formerly general manager of the Louisville, New Albany & Chicago, died in Chicago, Jan. 4, aged 59 years. Mr. Carson commenced his railroad career at the bottom of the ladder. When a boy he carried water for the laborers on an Ohio railroad, and at 20 he was in the employ of the engineering corps that was constructing the Cleveland, Columbus & Cincinnati road At 21 he was a freight clerk on the Michigan Southern, and his rise from that time was rapid. For six years he was general freight agent of the Toledo, Wabash & Western, and for six years was general manager of the Hannibal & St. Joseph. In 1883 Mr. Carson was appointed vice-president of the Chicago & Western Indiana, and in the next year president of the road and general manager of the Louisville, New Albany & Chicago. During his connection with the last two companies Mr. Carson became one of the best known railroad men in the West.

Mr. Edward Nichols, president of the Brooks Locomotive Works, died of pleuro-pneumonia at Dunkirk N. Y., on the 6th of January. A year ago Mr. Nichols narrowly escaped being burned to death in the Leland Hotel, Syracuse, and his health was never perfect since. He was born on Sept. 13, 1850, in Middlebury, Vt. At the age of 16 years he entered the Rensselaer Polytechnic Institute at Troy. Here he fitted himself especially as a metallurgical and mining engineer. During a part of the senior year of his course here he was assistant professor of chemistry in the institute, and after his graduation in 1871 he occupied the chair of chemistry for one and one-half years. During the years 1875–76 he traveled in Europe, and upon returning to the United States he was appointed by the American Institute of Mining Engineers to a position on the Reception Committee to entertain foreign engineers who visited the Centennial Exposition at Philadelphia in 1876. He afterward traveled extensively throughout the country, principally in the South, making examinations of puddling and blast furnaces and finally became associated with extensive iron manufactures. In July, 1887, he was elected to the presidency of the Brooks Locomotive Works.

Mr. W. F. Turreff, assistant superintendent of motive power of the New York, Lake Erie & Western, died in New York City, Jan. 17, of pneumonia, after a very short illness. Mr. Turreff had been connected with the Erie lines since the fall of 1890, first as master mechanic of the Chicago & Erie, and later on the New York, Pennsylvania & Ohio. He had been in charge of the motive power department of the system for some time on account of the long continued illness of Mr. Ross Kells. Mr. Turreff was born in Toronto, Ont. in 1834, and has been in railroad service since 1853. He was for nearly 20 years foreman in the mechanical departments of various Western railroads, and was general foreman of the shops of the Cleveland & Pittsburgh at Cleveland between 1866 and 1874. In the latter year he was appointed master mechanic and master car builder of the Cleveland, Tuscarawas Valley & Wheeling, and Jan. 1, 1881, he became superintendent of the Indianapolis division of the Cleveland, Columbus, Cincinnati & Indianapolis, and general master mechanic on March 27. Soon after the consolidation of that road and the Cincinnati, Indianapolis, St. Louis & Chicago, he was superintendent of motive power, but resigned a few months later, and became connected with the New York, Lake Erie & Western.

The Y. M. C. A. Line.

We are headed to get there, and our trains move daily at all hours of the day, every day, and every other day and Sunday, with daylight all the time, and not a fly on the train.

Our consolidated trains now include the Calvanistic Straight Gauge system, the Great Armenian Trunk line, the Episcopalian Bridge Company, and the Canal Company, of Baptisteria.

We run Wagner-Pullman vestibuled coaches, and dining room, drawing room sleepers, having patent buffers with perfumed air in the brakes, and with highly ornamental nickel plated heating appliances, which use only kiln dried and deodorized steam, thus avoiding all danger from fire.

This last apparatus was specially designed, invented, contrived and intended for the sole and only use and benefit of our line, and all competing lines are cautioned against infringing on our rights. "Automatic couplers" are attached to all trains, and blank marriage licenses are kept constantly on hand.

Rains are ordered from one of the most celebrated makers in advance of the moving of every train, thus securing freedom from dust; and the sun shines on every part of our route every day.

The "main line" and all the "branches" are provided with block signals, and in almost any block in the city you can find some one who has been saved from danger through the means we have provided.

Young man, try this route.

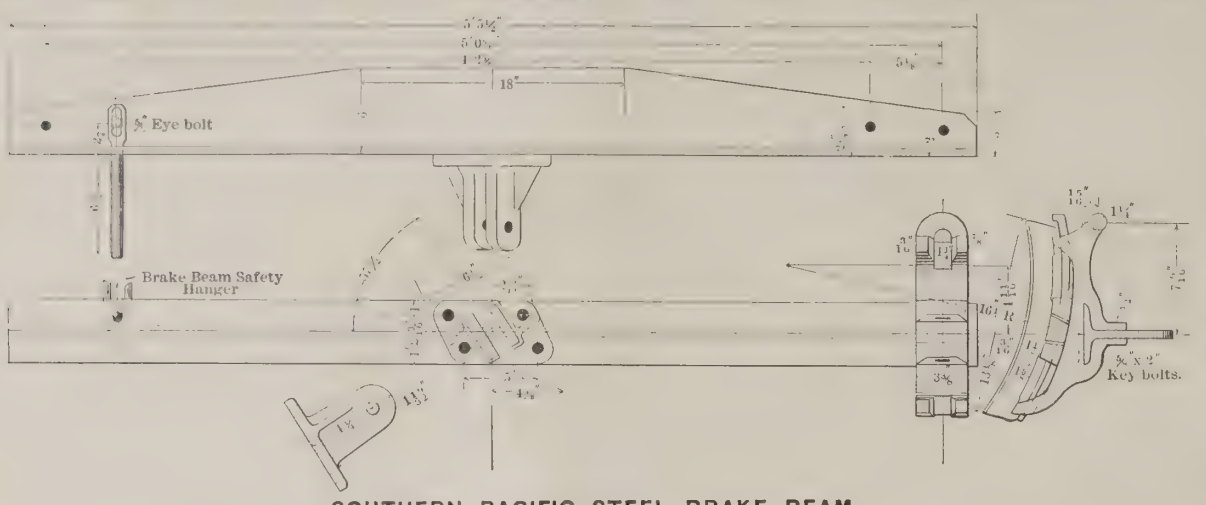
Silas Farmer, in Detroit Magazine.

Southern Pacific Steel Brake Beam.

The officers of the Southern Pacific have conceived the idea of utilizing old steel rails for the manufacture of brake beams, and have made large numbers of them as illustrated in the engraving herewith. These brake beams are made from 61½-lb. steel rail, and the process of manufacture is simple and inexpensive.

Following are the weights of the different parts:

1 Steel Brake Beam	87.00 lbs.
2 Guide Pins	2.50 "
2 Brake Shoe Keys	2.00 "
2 " Head Key Bolts	.81 "
2 " " " " Keys	.05 "
2 " Heads	36.00 "
2 " Shoes	48.50 "
1 Lever Fulcrum	13.75 "
4 Rivets, ¾-in	1.75 "
Total	192.36 lbs.



SOUTHERN PACIFIC STEEL BRAKE BEAM.

The Queen & Crescent have just established a new line of vestibule trains between Cincinnati and San Augustine, Fla. These trains are marvels of beauty containing buffet sleeper, boudoir car and coaches equipped with the Scarritt, high back seats, covered in gold plush. These trains attracted a great deal of attention and were inspected by many prominent railroad men who highly praised their elegance. The trains were equipped with the Barr vestibules.

The Scarritt Furnishing Company have just shipped to the Pullman shops at Detroit equipment for 10 new passenger coaches, which are being turned out there, for the Chicago, Rock Island & Pacific road. The coaches are said to be very elegant and are equipped with the best style of the Scarritt high back seats with adjustable foot rest.

Hale & Kilburn seem to be keeping up their record in the seat business. They are now going on the Chesapeake & Ohio cars, the Eastern Illinois, the Big Four, Reading, New York Central, Pennsylvania, Burlington, and many others, as well as in the 375 street cars being built for the Third Avenue Cable in New York, and the 50 Elevated, Chicago.

Mr. W. J. Woosley, Western manager of the Anderson-De Puy Company, of Pittsburgh, was in Chicago recenty, and his order book shows the result of some very good work in the last few weeks. The sales of this company, since Mr. Woosley has been its Western manager, have largely increased, as he is a favorite and quite popular with the trade. His office is in the International Bank Building at St. Louis.

The Mowry Car Wheel Works, of Cincinnati, O., report business good. Their wheels are used on a number of railroads, and have given good service. Some of them have a record of 10 and 12 years service on both freight and passenger cars. They also make car wheels for electric and cable roads.

Messrs. J. A. Fay & Co., Cincinnati, O., owing to the large increase in their already very large business, have been obliged to increase their premises, and have purchased the building adjoining, giving them an additional floor space of about an acre. This will make the floor space used by them for the manufacture of wood working machinery cover an area equal to five acres.

Curtis & Curtis, of Bridgeport, Conn., manufacturers of the Forbes patent die stock pipe cutting and thread machinery, have just shipped to the Pacific coast, on one order, 14 of their pipe cutting and threading machines.

Byram & Co., exclusive manufacturers of the Colliau cupola furnace, have recently made shipment to Leland Stanford (Jr.) University, Palo Alto, Cal., of one of their cupola furnaces, together with other foundry supplies.

E. W. Penfield, for several years connected with the C., B. & Q. R. R., a well known writer in railroad journals, has become connected with the Q. & C. Co. in the interest of the Servis tie plate.

The Globe Company, of Cincinnati, manufacturers of letter filing cabinets, have sent us copies of their calendar for 1892. It is an exact facsimile of their cabinet index, and contains numerous illustrations of their office appliances.

The Jos. Dixon Crucible Company, Jersey City, N. J., has issued a circular describing and illustrating the various uses to which graphite is put. It is a catalogue that will be of interest alike to engineers, manufacturers and railroad men.

Mr. J. J. Henry, General Manager of the Universal Brake Beam Company, has removed his office to Room No. 510 Phenix Building. This company has recently placed 1,400 of their brake beams on cars of the East Tennessee, Virginia & Georgia, and the C. & O. and T. P. systems.

The shops of the Madison Car Company, of Madison, Ill. although only recently furnished, are full of work. They are fitted up with the most improved machinery and have a capacity of 40 cars per day and 200 car wheels. This it to be increased shortly to 50 cars and 400 wheels per day.

By permission of Mr. H. Walter Webb, the Consolidated Car Heating Company announces that it is equipping 106 new coaches of the Central road with an improved system of direct steam heat. If this system gives the satisfaction expected it is to be applied to all new cars built by the Central road in 1892 and 1893. The New York Central have also given the Consolidated Company a considerable order for automatic temperature regulators, and these will be applied to cars which will be in service this winter.

"How is it, Mike, that yez don't spend the money yez used t' ?"

"Well, Denny, I'll tell yez. Ye sees, I get me $16 ivery week, an' I used 't tell the old lady that I was only gettin, tin dollars. I usty put tin dollars in wan pocket for the old lady an' the other $6 in me other pocket for myself, d' y' see?" Well, about three weeks ago shure I forgot to separate the money, an' when I got home I handed the old lady the whole $16. A little whoile after she sez t' me:

"How much did yez make this week, Moike?" "'Tin dollars,' sez oi. "'Th' $6,' sez she.

"An' then it kem t' me all in a minute, an' I sez: 'Oh, he must ha' med a mistake an' given me some wan else's money. Give it here t' me. an' I'll tek it back t' him agin." But the divil a penny would she gimme me, an' the very next day she kim down t' see th' boss. Of course she found out that I was makin' me $16 a week, an' now I have to give her ivery cent."

Before arranging for a western trip, it would be well to notice a few of the special advantages offered by the popular Big Four route. Solid vestibuled trains, heated by steam, and equipped with palace sleeping cars, reclining chair cars, and elegant dining cars make direct connection at Cincinnati, Chicago, St. Louis & Peoria with through express trains for all points in the West, Northwest and Southwest. Passengers will find the Big Four route the popular line to San Francisco, Los Angeles, San Diego, and all points in California and Mexico. Tourist tickets via the Big Four route at special low rates are on sale at all coupon ticket offices throughout the country.

Howe, Brown & Co., steel manufacturers, of Pittsburgh, are contemplating the erection of six or eight more puddling furnaces at their plant in that city. This firm have a large number of orders on hand and are operating the plant night and day. Their present equipment is insufficient to keep them fully supplied with muck iron, of which they use a special quality.

S. W. McMunn has been appointed special railroad agent for Carnegie, Phipps & Co., Limited, of Pittsburgh, Pa. Mr. McMunn's headquarters will be at Pittsburgh.

The Dayton Manufacturing Company, of Dayton, O., are very busy with orders for their car hardware. Some of their recent designs in car trimmings are very beautiful.

A new circular, issued by Westinghouse, Church, Kerr & Co., of Boston, entitled "Notes on Power Plants," contains much valuable information for all who are interested in such plants for electric lighting, electric railways, etc.

The O'Neil highway crossing alarm, manufactured in Cleveland, O., has recently been placed upon the New York, Susquehanna & Western Railroad, and the New York & New England Railroad. Quite a number of railroads have them in use.

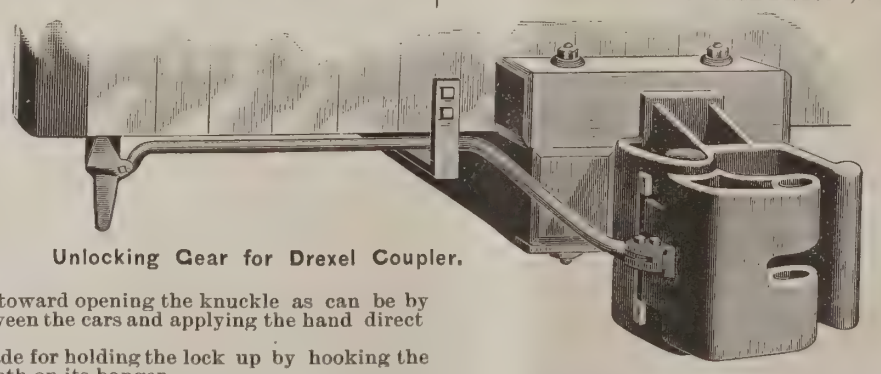
The McConway & Torley Company, of Pittsburgh, are doing an enormous busine s with the Janney coupler. They report that during the first eight days in December they received orders for no less than 17,000 freight car couplers.

The Peninsular White Lead and Color Company, of Detroit, Mich., are rapidly gaining ground in the introduction of their paints to the railway trade, their business for this year being more than double that of last year.

Unlocking Gear for Drexel Coupler.

The accompanying illustration shows the connections to the Drexel coupler as applied to freight cars. The first part of the movement of the lever at the side of the car raises the lock, while a continuation of the same pull operates positively and directly to pull the knuckle into an open position. These connections are unexposed and the liability to breakage by being struck is reduced to the minimum. An important advantage is found in the fact that they are self-adjusting and that no bending or changing in the position of the drawbar can prevent their successful operation.

By this method the very important advantage is gained of being able to open the knuckle from the side of the car, thus freeing the trainmen of all necessity whatever of going between the cars to effect a coupling. With the leverage obtained, three times as much force can be applied from the corner of the car toward opening the knuckle as can be by a man going between the cars and applying the hand direct ly to it.



Unlocking Gear for Drexel Coupler.

Provision is made for holding the lock up by hooking the lever behind a tooth on its hanger.

It will be noticed that near the point where the connecting rod comes out from under the end sill it is supported by a heavy stirrup. By this an additional strong advantage is obtained. In case of breakage of the tail-bolt or of the draft rigging connections, the drawbar cannot pull out and fall on the track. When the drawbar is pulled out to an abnormal position, the connecting rod is pulled up against the side of the stirrup, which then operates directly to raise the lock, permitting the knuckle to swing open, leaving the drawbar hanging in its supports.

The Drexel coupler, with these connections, is now in service on a large number of cars on twelve different railroads where it is giving excellent satisfaction.

The business of the Blakslee Manufacturing Company is increasing daily, and the works are rushed to their utmost in order to fill their orders now on the books.

The Delaware & Hudson Canal Company have adopted the Sewall coupler for all their passenger equipments. They have also determined to use the Consolidated Company Automatic Temperature Regulators on a good portion of their passenger equipments.

The firm of Bolen & Bond has been changed to a stock company, to be known as the Bolen, Bond & James Co., to continue the manufacture of fine railway carriage and other varnishes at Newark, N. J. Henry James, the secretary of the company, has been for many years well and favorably known to the trade.

The Universal Radial Drill Company, Cincinnati, O., have plenty of orders on hand. Among the more recent of them is one from the Grant Locomotive Works, Chicago, for a locomotive frame drill. This drill will have three independent spindles, with a maximum spread of 23 feet. It will weigh about ten tons. It is designed for drilling on side frames of locomotives.

Mr. W. G. Richards, who invented and perfected the processes by which solid cast steel car wheels have been made successfully, has resigned the superintendency of the works of the American Steel Wheel Company. These wheels have demonstrated their strength, soundness, and wearing qualities during more than two years of service in railroads running fast and heavy passenger trains, and where the requirements are exceedingly severe.

The Hollenbecher Forge and Iron Company, of St. Louis, started on Tuesday, Dec. 15, one of the Blakslee Manufacturing Company's special coupling pin machines, which accomplished a feat never before recorded. This machine takes the iron as it leaves the rolls, without reheating; passing it through the machine, it comes out a perfect coupling pin, ready for the market. It makes a complete pin at less cost than the iron can be sheared to length for the receiver.

In consequence of confusion arising from similarity in names of competing heating companies, the Baker Heater Company has sold its business to William C. Baker, and all business will hereafter be transacted in his name. All orders will be filled by the undersigned, and the business will be carried on as heretofore, except that the same will be in the name of William C. Baker, who has no connection with any other concern bearing the name *Baker*.

My long experience in heating buildings and railway cars (being the original inventor of the Baker Car Heater, and all improvements thereon), should be assurance to customers of successful heating apparatus, and perfect work.

WILLIAM C. BAKER.

There is considerable discussion in relation to the merits of the several brakebeams upon the market, and it is claimed by the National Hollow Brake Beam Company that all other tubular brakebeams are infringements upon the patent of Philip Hien, of April 12, 1887. Following is a letter that has been written by Mr. George Payson, general counsel of the Western Railroad Association.

[COPY.]

WESTERN RAILROAD ASSOCIATION,
CHICAGO, Nov. 16, 1891,

To the Members of the Association:

TRUSSED BRAKEBEAMS.

As is well known to most of our members, the National Hollow Brake Beam Company, of Chicago, has long been claiming that all other tubular brakebeams are an infringement on the patent of Philip Hien, April 12, 1887, No. 361,009.

This claim, however, has never been admitted by the association, but, on the contrary, is believed to be without any foundation whatever.

The National Company, having probably become convinced that no such broad construction could be given to the Hien patent, has recently made an arrangement with one Stephen Alley, who took out a patent in England, Dec, 12, 1881, for the method of making a U-shaped Trussed Brake Beam; and on the twentieth day of October. 1891, they obtained, as assignees of said Alley, a United States patent, No. 461,776, claiming broadly "A Trussed Metal Brake Beam in which are combined a concave-convex compression member, a double-inclined tension member and an interposed strut or draught piece, substantially as and for the purpose specified."

We are informed further, that the National Company have taken out this patent for the express purpose of prosecuting claims of infringement against the makers and users of any and all trussed brakebeams answering to the above description, and more especially that known as the "Universal Brake Beam," made under the patent of Johns & Slattery, June 24, 1890, No. 430,957, and which has come into quite extensive use; their contention, of course, being that the said United States patent of Alley, though later in date of issue, will anticipate that of Johns & Slattery by reason of prior invention.

We are advised by counsel that the claim above is either wholly invalid, or, if valid at all, that it can only be sustained by giving it a construction so narrow as not to cover the Universal brakebeam.

We have thought it proper, however, to call your attention to the matter, so that you might determine for yourselves what course to adopt under the circumstances. If any further information is desired it can be at once obtained by addressing this office.

By order of the Executive Committee.

GEORGE PAYSON, General Counsel.

The Atchison, Topeka & Santa Fe have ordered about fifty coaches of Barney & Smith, to be equipped with Hale & Kilburn high back coach seats, and double tete-à-tete reclining seats.

The Illinois Central has added five trains each way to its Chicago suburban train service, making 132 southbound and 133 northbound trains, or 265 in all. The first morning train reaches the city at 6 o'clock and the last night train leaves at 12:30 A. M. From 5 P. M. until 6:15 P. M., inclusive, leaving Chicago, and from 8 A. M. until 8:50 A. M. inclusive, arriving, trains run only 5 minutes apart.

Universal Wood Worker.

This illustration presents the latest improved wood working machine of The Egan Company. It has been especially designed for use in car shops, repair shops, etc., and because of the many kinds of work it is capable of is called the "Universal."

The column is one complete casting cored out, heavily braced and with ample floor space, insuring steady running, free from vibration when the mandrels are running at high speed.

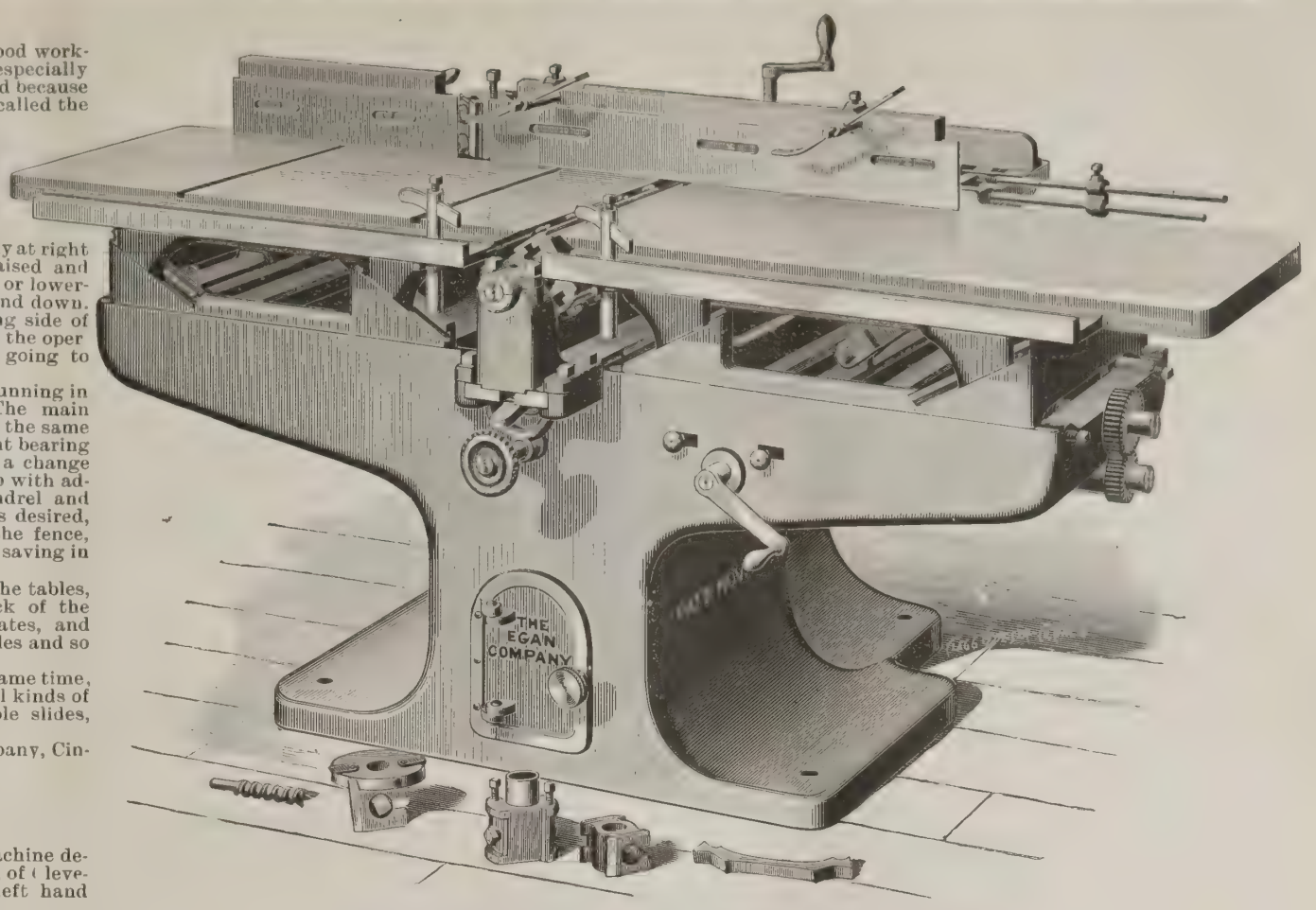
The tables are of extra width and length, planed perfectly true, and made with wide grooves to secure the gaining and paneling frames, and exactly at right angles to the cutter head. Either table can be raised and lowered independent of the other, or can be raised or lowered together on a circle of the head, or straight up and down. All of these adjustments are made from the working side of the machine close to the cutter head, which allows the operator to make the necessary adjustments without going to the end of the machine.

The mandrels are of the best quality of steel, running in self-oiling boxes, lined with Babbitt metal. The main mandrel is of large diameter, with the pulley on the same running between the two back bearings. The front bearing is adjustable and can be taken off instantly when a change of heads is desired. This mandrel is also fitted up with adjustable bearings, by which the boxes, with mandrel and head are moved back and forth across the bed, as desired, instead of making the adjustment by means of the fence, which will be found an advantage and a great saving in time

The beveling fences are made to adjust across the tables, one fence placed over the main head, and one back of the upright head. Both are made with sliding plates, and when beveled the lower part is close to the tables and so constructed as to have no forward motion.

Two men can work the machine at one and the same time, without any interference. It is capable of doing all kinds of boring, routing, rosette making, dovetailing table slides, and a general run of this kind of work.

For further information address the Egan Company, Cincinnati, O.



NEW No. 2½ EXTRA LARGE UNIVERSAL WOODWORKER.

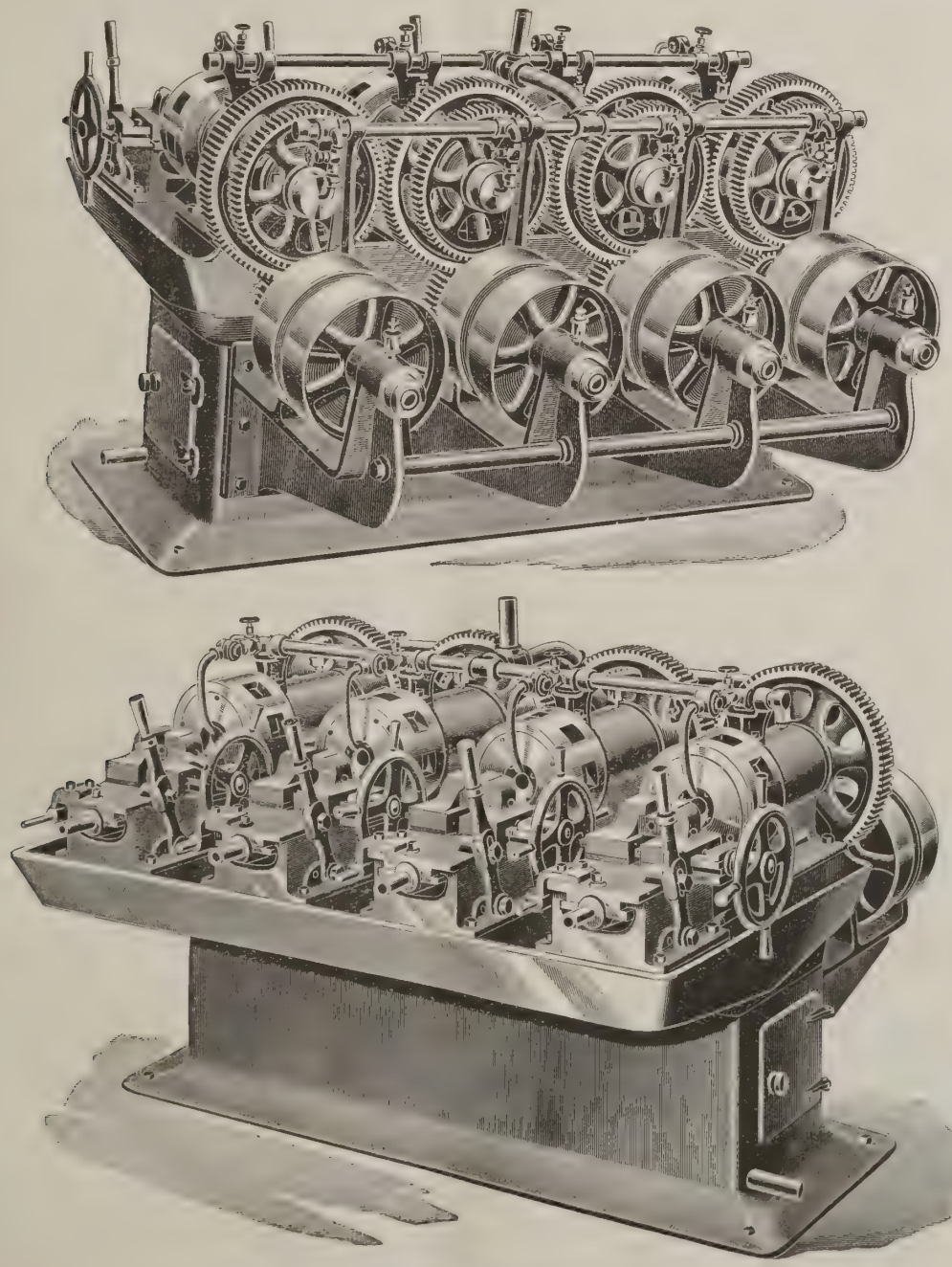
With Vertical Spindle, and 19½ in. Main Head.

A Special Threading Machine.

We herewith illustrate a special threading machine designed and built by the Acme Machinery Company, of Cleveland, O., for the purpose of cutting right and left hand threads on track bolts in one operation.

This machine is constructed with a box-shaped base, forming a tank for the lubricant, to which is fastened a cast iron pan, carrying the head stocks and carriages, and bolted to the rear are four brackets for supporting the friction pulleys, Each carriage is supplied with a vice or holder for the bolt. and an automatic reversing gear. The head stocks are made solid, and bushed with phosphor bronze, each carrying two spindles, one revolving within the other. These spindles are driven by means of spur gears, as shown in the accompanying cuts, the large gear driving the outer spindle, and the small gear the inner spindle, one to the right and the other to the left, at exactly the same speed. Bolted to the front end of each spindle is a steel head or disk, having four chasers set radial from the center, thus forming a solid die. The friction pulleys are loose on the shaft, and are driven from the counter overhead with quarter-turn belts, each pair having between them a cone-shaped friction disk keyed to a rod passing through the center of the shaft. This rod extends to the front of the machine and immediately under the carriage, and is so arranged as to be controlled by the same with a hand lever on the side, The lubricant is supplied from a separate tank and conveyed to the dies by means of pipes as shown, the pipes in the front supplying the right hand dies, and are made with hinged joint; those in the rear supply the left hand dies through the center of the inner spindle, after which it is strained and conveyed to the tank or base of the machine, then from this it is pumped through the pipe shown near the bottom.

TO THREAD A BLANK TRACK-BOLT.—The bolt is placed in the holder or vise, the carriage is then moved forward with the hand lever until the point of the bolt enters the right hand die; the bolt then is fed through it to the left hand die. These dies are three-quarters of an inch thick and are set $\frac{3}{16}$ inch apart. Thus it will be seen from the dimensions given that a right hand thread will be cut on the bolt $\frac{15}{16}$ inch in length before the point of the bolt enters the left hand die. For example: Supposing a thread to be cut two inches in length, the left hand thread will be then two inches minus $\frac{15}{16}$ inch long, or $1\frac{1}{16}$ inches long. After these dies each perform their work and the thread is cut to its proper length, the machine is reversed automatically and at an increased speed. When the bolt is free from the dies the operator draws the carriage backward a short distance by means of the hand lever, which at the same time reverses the machine in the direction for cutting, thus making bolts with a right and left hand thread in a way almost as simple as a right hand thread alone.



A SPECIAL THREADING MACHINE.

The Boyden Brake Company, of Baltimore, Md., report that orders for their brake are on the increase, and that they are doing a very satisfactory business.

The American tin plate industry appears to be making rapid progress, notwithstanding some assertious to the contrary. In our last issue we reported that the N. & G. Taylor Company, of Philadelphia, who are old established dealers in roofing tin, had increased the output of their home-made article from 40 to 100 boxes per day. This firm has made many improvements for the trade during the 82 years of its existence, and they were the first house to keep a stock of special odd sizes of tin plates for the accommodation of buyers, showing how unnecessary it was to use a sheet and cut to waste when the very size wanted could be had.

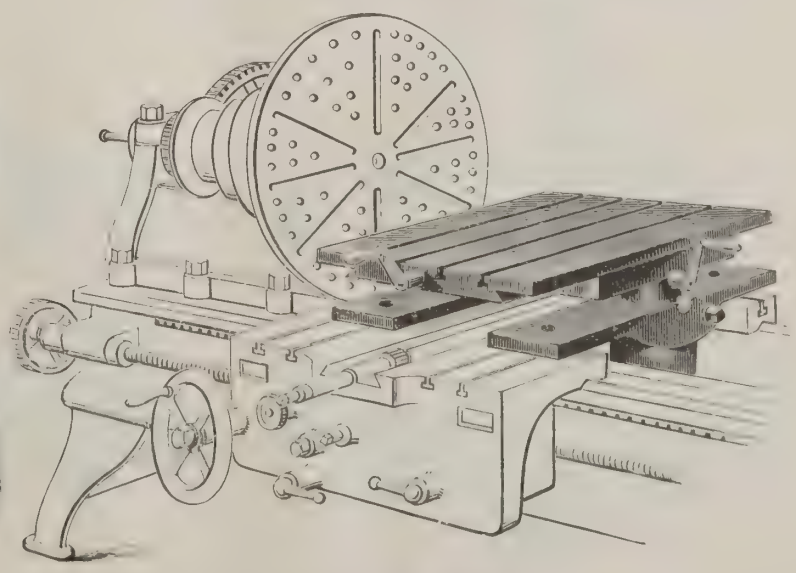
They guarantee all roofing tin sold by them. In this connection they offer to give two perfect sheets, or the value of same in cash, for every sheet that can be found of their "Old Style" brand of roofing tin showing the slightest imperfection; and if such a sheet has been used, they will, in addition to the above, bear the expense of having it removed from the roof and replaced with a perfect sheet.

Lathe Table Suited for Horizontal Boring and Milling.

The attachment illustrated herewith is intended to do the class of work that is done on a milling machine or horizontal boring machine, and is suited to any size lathe from 16 inches swing to 36 inches swing.

The 24-inch table has traverse motion of 20 inches and a vertical motion of 4 inches; table 24 inches square. This attachment is bolted to the carriage of the lathe, is raised or lowered by two screws working inside of two cylinder guides which can be clamped in position, making the whole very rigid and firm. It is applied to any lathe, and can be lifted to or from the lathe by a screw eye being put in center of Table.

The table is made in two sizes, 12 inches and 24 inches square, by C. K. Bullock, Nos. 1357-59-61 Ridge avenue Philadelphia, Pa.



LATHE TABLE.

Boring and Turning Mill.

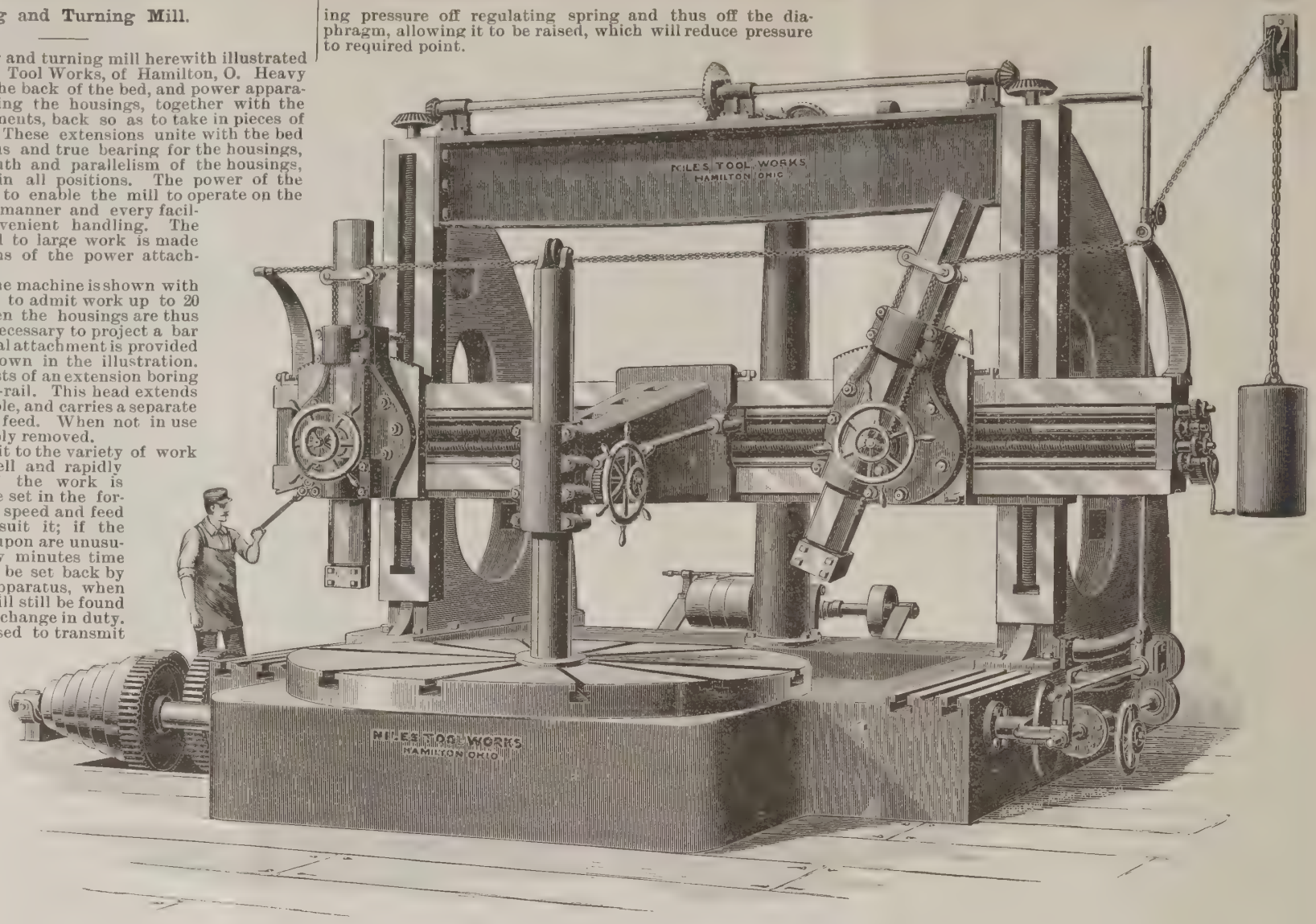
The 14-20-foot boring and turning mill herewith illustrated is made by the Niles Tool Works, of Hamilton, O. Heavy castings are fitted to the back of the bed, and power apparatus provided for moving the housings, together with the cross-rail and attachments, back so as to take in pieces of extra large diameter. These extensions unite with the bed in forming a continuous and true bearing for the housings, thus preserving the truth and parallelism of the housings, cross-rail and table in all positions. The power of the machine is increased to enable the mill to operate on the large work in the best manner and every facility provided for convenient handling. The change from standard to large work is made very quickly by means of the power attachments.

In this illustration the machine is shown with the housings run back to admit work up to 20 feet in diameter. When the housings are thus run back, it becomes necessary to project a bar for boring, and a special attachment is provided for this purpose as shown in the illustration. The attachment consists of an extension boring head fixed to the cross-rail. This head extends to the center of the table, and carries a separate boring bar with power feed. When not in use the attachment is simply removed.

There is hardly a limit to the variety of work which can be done well and rapidly onthese machines. If the work is small, the housings are set in the forward position and the speed and feed quickly adjusted to suit it; if the pieces to be operated upon are unusually large, a very few minutes time allows the housings to be set back by means of the power apparatus, when the range of speeds will still be found adequate for the great change in duty.

Splined rods are used to transmit motion to the feed and elevating gearing, hence nothing is disturbed by the change from standard to large work or vice versa.

Special attention is directed to the construction of these mills, which makes them entirely self-contained. The spindle of the table rests below on a steel step, which step is supported by a heavy casting in the form of a truncated cone extending down from the bed. Parties whose work would seem to require the use of both a large and a small boring and turning mill, would do well to investigate the merits of these extension machines. For ordinary every day jobs they are as efficient as the Niles standard pattern machines, while on the large work they are invaluable.



14—20-FOOT BORING AND TURNING MILLL.

With housings run back to admit work 20 feet in diameter and showing Boring Attachment in place.

Gold's Improved Pressure Regulator.

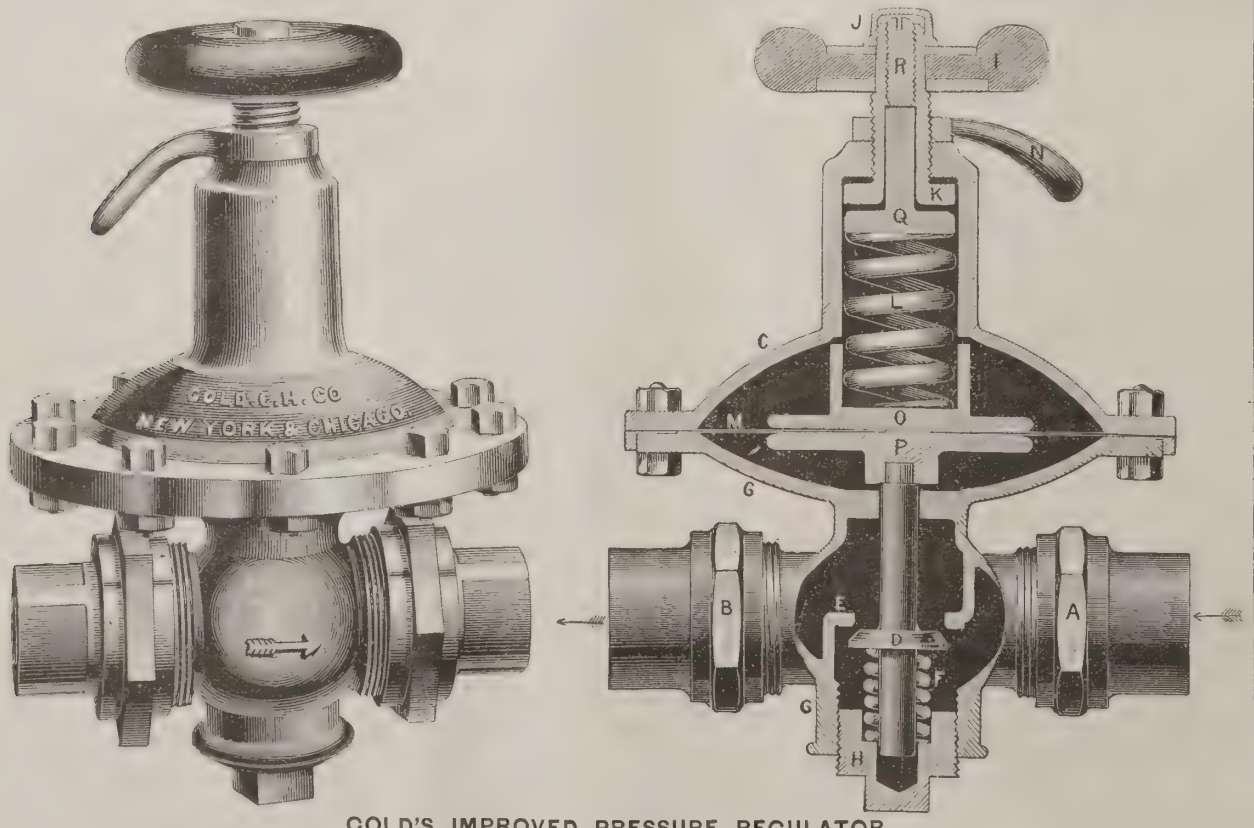
The device illustrated herewith is intended for use in regulating the delivery pressure of steam, oil, water and other fluids, and especially for application to locomotives for regulating the supply of steam to the cars for heating purposes. The body is all brass of the best quality, and is fitted with heavy brass unions, "A" and "B," for connecting to steam inlet and outlet. The body is made in two principal pieces, the upper part, or dome "C" and lower half or valve body proper "G." These two parts are firmly bolted together by ten steel hexagon nuts and bolts, and the flexible metallic diaphragm "M" is bolted in between them, thus dividing the regulator completely, there being *no opening between the upper and lower valves whatever.*

The construction is so plainly shown in the illustration that further description is unnecessary; but the setscrew "R" is a most important feature. As will be seen, it bears directly on the washer "Q" which rests on the spring. Before the nut "J" is put on, by adjusting this setscrew "R", the regulator may be set to deliver any maximum pressure desired, and no more. *To increase pressure* the screw is turned down, which will bear spring down and provide resistance for the diaphragm against such higher pressure required which would otherwise raise it and bring the valve to its seat. *To reduce pressure* the screw is turned up, taking pressure off regulating spring and thus off the diaphragm, allowing it to be raised, which will reduce pressure to required point.

As will be seen from the sectional cut, at the point where the valve stem "D" passes through the passage formed by guide cast on valve body, the space between valve stem and guide piece is very slight, but sufficient to allow the steam to slowly fill the space between diaphragm "M" and guide. This construction will prevent the rapid escape of steam when diaphragm is pressed downward, and will consequently form a cushion for the diaphragm, and prevent it chattering, as it otherwise would do. This cushioning also protects and prolongs the life of the diaphragm, as chattering will wear it out very quickly.

When the setscrew "R" is adjusted no movement of the handle will allow of the delivery of more than the maximum pressure it is set to deliver, although any lower pressure from one pound up can be delivered. Should, however, it be found advisable or necessary at any time to alter this maximum by removing the cap "J" it is a matter of a few moments to readjust the valve, a slot being made in the setscrew to recive a screwdriver.

This device is sold by the Gold Car Heating Company, Chicago.



GOLD'S IMPROVED PRESSURE REGULATOR.

One of the most handsome catalogues of railroad supplies that we have ever seen has just been published by the Adams & Westlake Company, of Chicago. The type work, the engravings and the fine toned paper vie with each other in exciting admiration. The articles illustrated are simply legion. One has to examine this beautiful volume to thoroughly appreciate the great variety of fittings that are used in the construction of cars. The catalogue will be a most useful book of reference for men having to order fittings for cars, and besides it will be an ornament to any master car builder's desk.

Our Directory.

Atchison, Topeka & Santa Fe.—J. C. Conroe, recently appointed master mechanic, has had his headquarters placed at La Junta, Colo.

Baltimore & Eastern Shore.—W. Thomson is now receiver and general manager. J. M. Jackson is no longer general superintendent.

Boston & Maine.—Wm. Smith, Superintendent Motive Power, died suddenly in Boston.

Central Vermont.—E. C. Smith has been elected president. J. G. Smith, deceased.

Chicago & Erie.—G. A. Coe has been appointed superintendent Western division, with headquarters at Chicago, Ill.

Cleveland, Cincinnati, Chicago & St. Louis.—E. P. Lord has been appointed superintendent motive power, vice F. P. Boatman, resigned.

Denver & Rio Grande.—N. W. Sample has been appointed general superintendent.

Fitchburg.—C. L. Mayne has been appointed superintendent of the tunnel division, vice F. F. Adams, resigned.

Fort Worth & Denver City.—E. W. Hayes has been appointed master mechanic, vice J. F. White, resigned.

Grand Trunk.—D. Morice has been appointed division superintendent at London, Ont., vice R. Larmour, resigned.

Kansas City, Wyanodotte & Northwestern.—G. Nurtsheimer has been appointed master mechanic, with headquarters at Kansas City. C. P. Brotherton has been appointed general manager, vice E. Summerfield, resigned.

Lake Shore & Michigan Southern.—W. H. Canniff has been appointed general superintendent; T. W. Niles has been appointed superintendent of the Eastern Division; J. K. Russell appointed superintendent Franklin Division; J. R. Reniff has been appointed master car builder Toledo Division, with office at Norwalk, O., vice B. F. Rumberger, resigned.

Long Island.—Mr. W. H. Blood has been appointed general superintendent, vice J. D. Barton, resigned.

Milwaukee, Lake Shore & Western.—M. Hughitt has been elected president, vice F. W. Rhinelander.

Missouri Pacific.—L. L. Keller has been appointed superintendent Le xington & Southern division, vice E. Harding resigned.

Mobile & Ohio.—D. O. Smith has been appointed master mechanic at Whistler, Ala.

Newport News & Mississippi Valley.—F. B. Staines of Newport, Ky., has been appointed assistant purchasing agent.

New York, Lake Erie & Western.—W. F. Turriff superintendent of motive power, died in New York, Jan. 17, 1892.

New York & New England.—Mr. F. E. Dewey has been appointed superintendent of the main line division, vice R. B. Williams, resigned. J. D. Barton has been appointed general manager.

Northern Pacific.—J. Dorsey has been appointed superintendent Yellowstone division, vice F. H. Marsh, resigned. G. W. Gardner, master mechanic Dakota shops, died on the 20th inst. after an illness of but three days.

South Carolina.—J. M. Turner has been appointed Superintendent, vice J. H. Agnew, resigned.

Wisconsin Central.—F. H. Marsh has been appointed Superintendent of Chicago Division, vice E. R. Knowlton transferred to the superintendency of the Chicago terminals.

Zanesville & Ohio River.—J. H. Sutor has been appointed General Manager, vice J. K. Gidders, resigned.

Wanted.

NATIONAL CAR AND LOCOMOTIVE BUILDER

MARCH, 1892.

CONTENTS.

The Long Island road is reported in the market for 300 cars.

The B. & O. is reported as about to order 1,000 freight cars.

The congested state of freight traffic continues, reaching as far west as Omaha.

The Cleveland & Canton has contracted with Pennock Bros. of Minerva, O., for 1,000 freight cars.

An electro-pneumatic signal plant has been put in at the St. Clair tunnel by the Union Switch & Signal Co.

The contract for 1,250 freight cars for the Central of New Jersey was awarded to the Lehigh Valley Car Works, Stemton, Pa.

The Grand Trunk has secured an additional number of Pullman tourist cars for the benefit of its Pacific coast bound business.

The 21 compound engines recently ordered of the Baldwin Locomotive Works by the Philadelphia & Reading are completed.

The Cleveland, Cincinnati, Chicago & St. Louis has contracted with the Barney & Smith Manufacturing Company, of Toledo, for 1,000 cars.

Mail advices from the Argentine Republic bring information of the discovery of a vast bed of silver in the bottom of the bay of San Blas.

The New York, Lake Erie & Western Railroad locomotive shops at Susquehanna, Pa., are to be placed on eight-hour time, a reduction of one hour per day.

The Pullman Company has recently built some handsome vestibule passenger cars for the B. & O. according to designs furnished by Master Car Builder Grieves.

The Central Equipment Company, of Terre Haute, Ind., has been incorporated. The capital stock is $50,000. The company will engage in the manufacture of freight cars of all descriptions.

The Transandine Railway Company has been fined by the Argentine Government for opening a section of its line between Uspallata and the Rio Blanco without permission of the Railroad Board.

Four judgments against the New York Locomotive Works, of Rome, N. Y., have been filed by the Midvale Steel Company, of Pennsylvania. The aggregate of the judgments is $5,909.86.

Immense avalanches of snow have fallen on the Austrian railways between Obertraun and Aussee, and between Windhofen and Rosenau. It will take several weeks to repair the damage done.

The Japanese Government has submitted a bill for constructing new railroad lines, purchase of private lines and issuing of railroad bonds. It is proposed to build about 700 or 800 miles of new road.

The business of the fire insurance companies was less satisfactory, owing to the enormous destruction of insured property by fire, in 1881, than during any previous year since that of the great Chicago conflagration.

The Supreme Court of Texas has rendered a decision that inasmuch as the law mentions specifically as liable for injuries inflicted on railroads, owners, proprietors, etc., and omits receivers, the latter cannot be held responsible.

The Rapid Transit Commission appointed by the City Council of Chicago, has reported in favor of elevated terminals for all steam roads, the exclusion of all horse cars from the heart of the city, and the repeal of the ordinance forbidding more than three cars in a cable train.

The Duncan Locomotive and Car Brake Company, has been organized at East St. Louis, to manufacture locomotive and car brakes and appliances generally; capital stock, $1,000,000. Incorporators: John F. Baumgartner, Charles Warren Duncan and Shepard Knapp.

A locomotive boiler explosion occurred Feb. 2 on the Chicago & Alton Railroad near Joliet, Ill. The engine was pulling a heavy freight train up a grade, being assisted by a pusher engine, when the boiler exploded, killing two men and injuring another.

The Queen and Crescent Railroad shops at Meridian, Miss., were burned Feb. 26, destroying everything except the roundhouse and the master mechanic's office. The loss is $150,000, fully insured. Five hundred men are thrown out of employment.

A meteoric stone partly covered with a solid film of gold is reported as found near Cave City, Calaveras Co., Cal. The stone is about as large as a man's fist and is remarkable as being the first case noted where gold has been found in connection with meteoric iron.

A Georgia paper seates that the general practice of carrying preachers at two cents a mile has revealed to the roads of that State the fact that they run through the greatest missionary field in the world. About one-half the colored population have become exhorters, to teach the truth to the other half.

A lamp exploded in a mail car on the New York Central Feb. 1. The only clerk at work in the car did not notice the fire until the car was partially enveloped in flames. The contents of the burning car, which was known as the paper or storage car, bound for the New England States, were totally destroyed.

A dispatch from Penza, Russia, says the thermometer registered 58 degrees below zero Feb. 11, and that there is terrible suffering among the peasants. A number of men have been frozen to death on the high roads, and so intensely cold is it that birds drop dead from the trees in which they have sought shelter.

The first Bessemer steel made in the Lake Superior District was blown on Jan. 27, by the West Superior Iron & Steel Co., at West Superior, Wis. The company will manufacture plates and structural shapes. The plant was built by the Pittsburgh Iron & Steel Co. Mr. W. F. Mattes is the General Manager of the new works.

The Michigan Car Company and the Peninsular Car Company, both of Detroit, have recently placed orders for 5,000,000 feet of sills, decking, siding, lining, etc., at mills along the New Orleans & Northeastern Railway in the yellow pine belt. This indicates that the car manufacturers are doing much to restore activity in the yellow pine business.

It is reported that California will send two elegantly furnished railroad coaches made from a single butt of a large tree, to the Columbian Exposition. The tree will be felled so as not to splinter it, and will then be sawed to a proper length for passenger coaches. The interior will be cut out, and doors and windows made to complete a serviceable passenger car.

A Georgia editor has a grievance against one of the railroads. He says that he is perfectly willing, in return for an annual pass, to throw on wood at stations, help grease the engine and assist in handling baggage; but when he breaks his leg while chasing a delinquent subscriber through the train he should be allowed reasonable damages.—*Atlanta Constitution.*

An order was received by the Baldwin Locomotive Works, Jan. 20, from the St. Louis Merchants' Bridge Company for four large engines, and on Jan. 25 the engines were finished and ready for shipment. Between the date of filling the order and its completion a Sunday intervened, so that the actual time consumed was only four days, or one day for each engine.

The new Burlington bridge across the Mississippi River at that city is about completed. It is a double track railway bridge, costing $400,000, and replaces the first iron bridge to span the Mississippi, built in 1865-66 at a cost of $1,200,000. The old bridge could not stand the heavier equipment of the present day and the enormously increased traffic.—*Engineering News.*

India is being gradually opened up by railways. During the years 1889-90, 869 miles were opened up for traffic, and in 1890-91, 874 more miles were added, making the total mileage up to the end of March last 16,996, while 1,095 miles of new lines have been sanctioned, which will raise the total to 18,879, or 1,130 miles more than in the corresponding period of the previous year.

The lease of the Lehigh Valley Railroad and the Central Railroad of New Jersey to the Philadelphia & Reading Railroad Company is announced. Following upon its acquisition of the new lines, the Reading Railroad Company has decided to build an extension of 500 feet to its repair shops, giving them a total length of 1,250 feet, and employing 800 to 1,000 men, instead of 400, as now.

The New York Central Railroad is about to erect repairing and construction shops at Buffalo, at a cost of $500,000. When completed, these works and the shops at West Albany will enable the company to build about all the locomotives which their service will require. The new shops will rival the works of the Pennsylvania Railroad at Altoona, which rank among the finest in the world.

HEAVY ON THEIR DRIVERS.—John Dietel, who has been on exhibition at a museum as a giant, died recently from an attack of the grip. His waist measure was given at eight and a half feet and his weight as 763 pounds. He was a butcher in Baltimore, where he recently was mar, ried. His wife, who came here with him, has a waist measure of six and three-quarter feet and weighs 596 pounds.

All trains on the Philadelphia division of the Baltimore & Ohio are now running under the block signal system similar to that on the Pennsylvania road. The business of this division and the "Royal Blue Line" has now reached large proportions, and the prompt movement and safety of trains has made the change necessary. For some time portions of the New York and Washington line have been under the system.

A serious wreck occurred on the Chicago & Alton at Larabee, Feb. 7. A passenger train running 45 miles per hour was turned from the main track to the passing track by an open switch, and collided with a stock train that was awaiting its arrival. Both engines were wrecked, and the freight engineer and fireman, and the passenger fireman killed. The passenger engineer had both legs broken and was otherwise seriously injured.

Grain shippers have been greatly discommoded by the slowness of the eastern roads in handling business, and most of them have lost money by not being able to get their property to the proper destination in time. In the first part of February, one of the largest shipping houses in the trade had 300 cars of grain between Chicago and the East, on which there was a loss of $50 per car. This is only an illustration of what shippers have been forced to undergo for some time past.

Brakeman Herrick, who, in failing to protect his train while out flagging, caused the disastrous collision at Hastings, on the New York Central, Christmas Eve, that resulted in the death of 13 persons, has been indicted for manslaughter in the second degree. The conductor and engineer of a construction train on the Philadelphia & Reading, who, by their carelessness, caused an accident by which three men were killed, have also been indicted for manslaughter.

The Imperial railway train that has just been made to order for the German Emperor has cost the Prussian exchequer nearly $1,000,000. It is composed of 11 carriages connected by corridors, and all constructed on a style of unparalleled luxury and magnificence. One carriage which is designed to be the Kaiser's study, is hung with real Gob elin tapestry from Charlottenberg, and the salon carriage is upholstered in white satin. The remaining cars comprise a nursery, a reception-room adorned with marble statuary, an oak dining-room, a kitchen and bedrooms for several guests.

An electro-chemical method of sharpening files has been published by an industrial association of Paris. It is the idea of M. Personne, and consists in cleaning the files from grease, then suspending them for 20 minutes from a metal plate in a mixture of 100 parts water, six parts nitric acid and three parts sulphuric acid. The plate is connected with several carbons in the same liquid. The corrosion of the metal takes place in the cavities only, the edges being sharpened exactly as by a file cutter. The process is said to be satisfactory and economical, and it may be applied to the sharpening of chisels and other tools.

The new Edison shops of the Northern Pacific, mention of the opening of which was made in these columns last month, are composed of 17 buildings, ranging from one to two stories in height. Each building is of brick, with stone foundations and covered with steel trussed roofs. The buildings alone cost $1,040,000, and the new machinery placed in them cost $160,000, making the total expenditure ever $1,200,000. This does not include the machinery removed to the new shops from the old. The plant covers 70 acres of land, and the floor space of the buildings aggregate 221,370 square feet, while nine miles of tracks are necessary for serving the shops. Two hundred and fifty men will be given employment at the shops at once, and the force will be increased from time to time as occasion demands.

Pullman's Palace Car Company Standard Sleeping Car.

(*Continued from page 2.*)

VESTIBULE.

Although it has been used in a crude form and in a few isolated instances, the vestibule is practically a recent invention, and it has proved itself such a convenience that it may now be found on almost any one of the more prominent passenger trains.

The Pullman car now under consideration is so equipped, in fact, the vestibule as now used originated with this company and was first applied to cars built at its works.

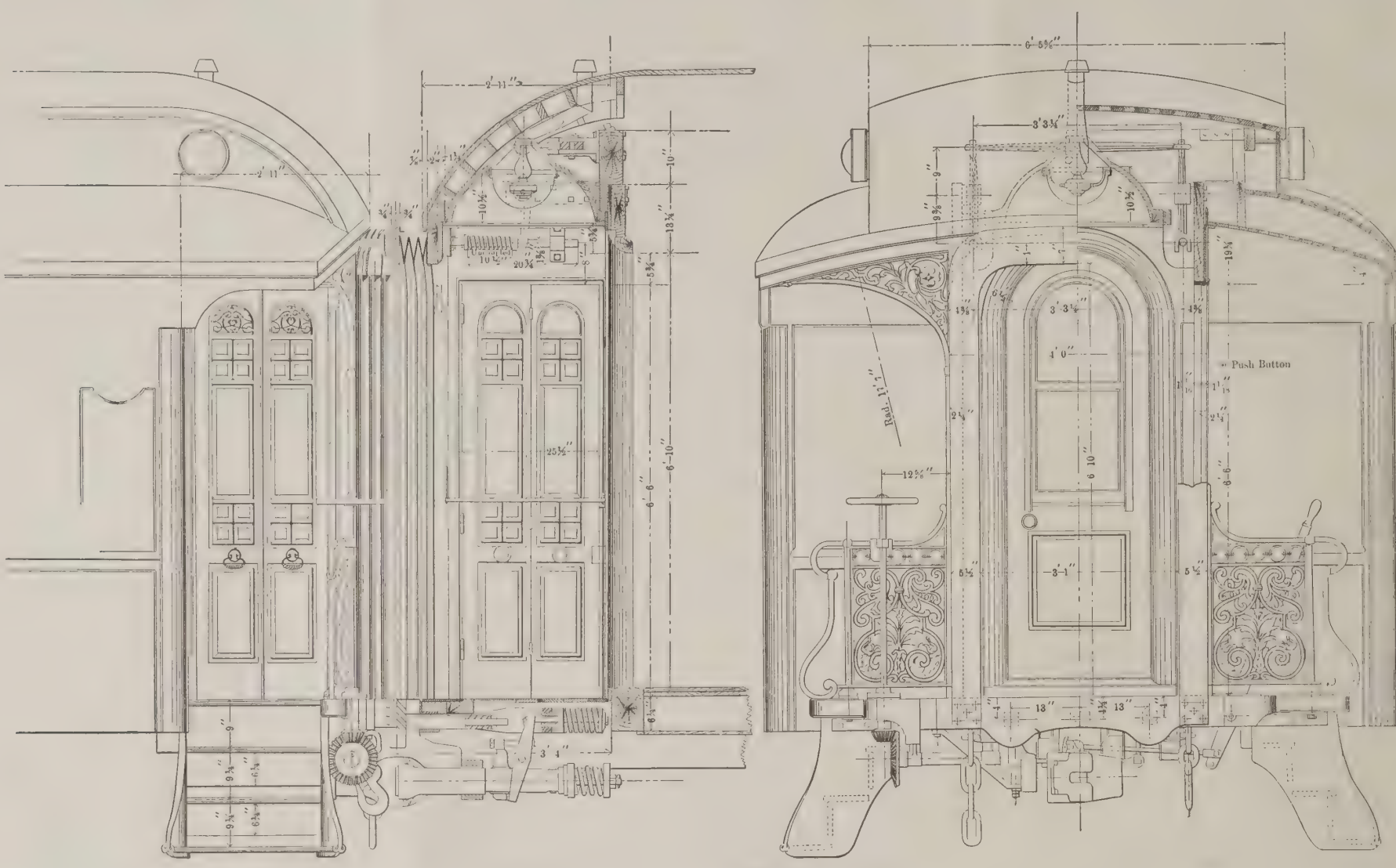
As the construction is more complex than a casual observation would indicate it has here been illustrated with detail drawings. The platform on which the vestibule is located is strenghtened by plating the knee timbers with iron, as shown in the plan; this, as well as the strengthening of the side frames of the body already referred to, is necessary to obtain the proper resistance to the strain produced by the friction of two vestibule plates in contact. This and a change in the form and size of the buffers are practically the only changes required in the construction of the platforms and draw gears, which are, in this case, of the Janney type, but may also be of the Cowell pattern which latter couples with the Miller.

The buffer bars or stems are hinged to a cast steel plate, which is 4 feet long and takes the place of the ordinary buffer heads. It is hinged to permit adjustment on curves and a third stem, which is in the center of the plate; is provided to take the strain when in contact with a car equipped with the ordinary Miller buffer. To close the opening between this buffer plate and the platform end timber, and thus make the platform continuous, a thin wrought iron plate which slides on a recessed plate of cast iron on the end timber is attached to the buffer head.

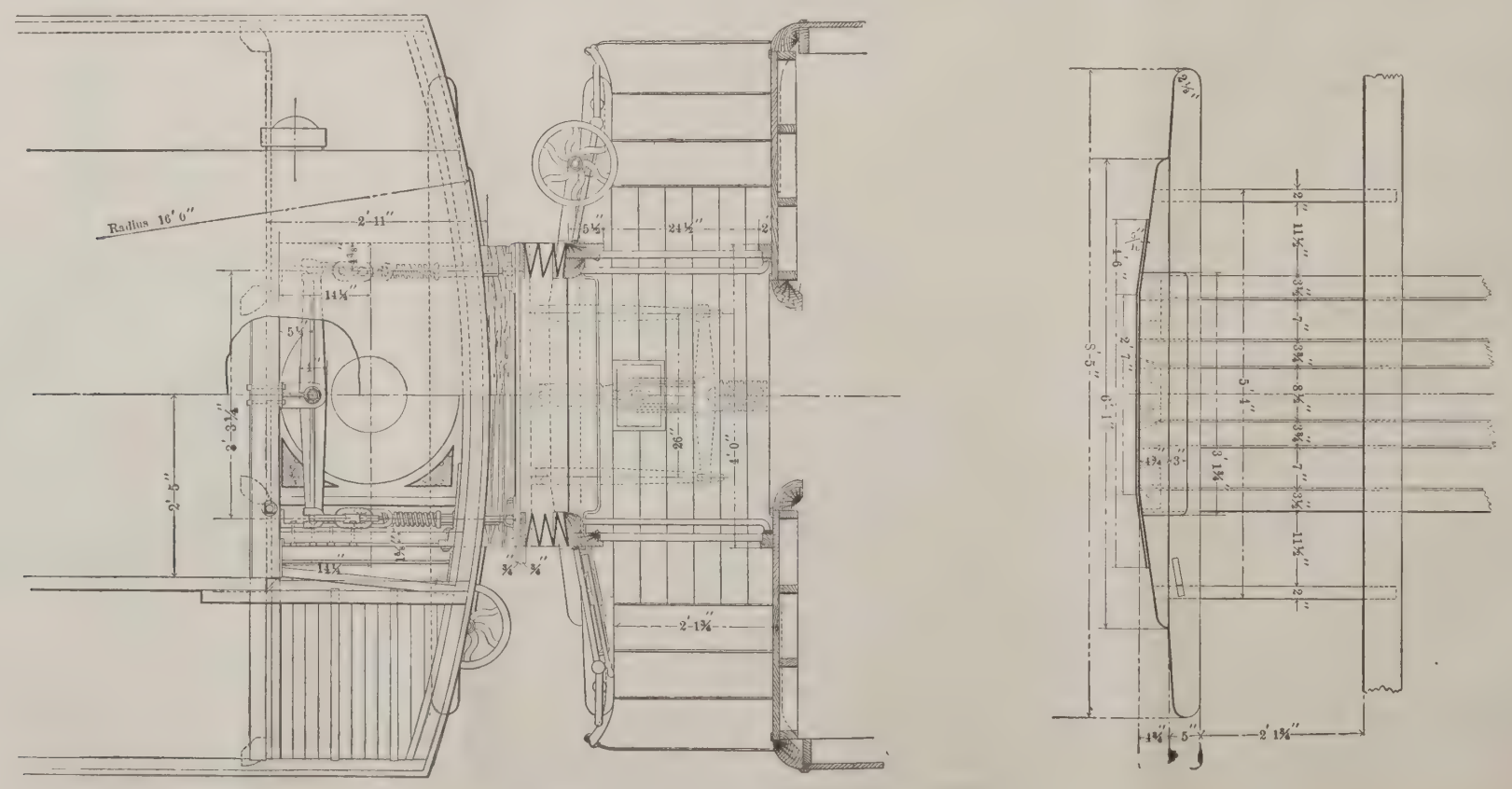
The so-called vestibule plate is in the form of an inverted U, the ends of which are attached to the buffer with stud-bolts, the whole forming an opening which is 3 feet wide and nearly 7 feet high. The plate is $\frac{3}{4}$ inch thick, $5\frac{1}{2}$ inches wide at the sides and 7 inches at the top, and its face is planed. To obtain a practically dust and rain proof joint between a pair of these plates an arrangement of levers and springs is provided in the platform hood, the springs to give the desired compression, which is nearly equal to that of the buffers, and the levers to compensate for the angularity produced when the cars are on a curve. A single equalizer like that employed for the buffer would answer the purpose if it were convenient to introduce it on a line with the points of attachments of the frame plate.

The arrangement used consists of two bars or stems which are attached to the vestibule plate with ball and socket joints by means of suitable castings and are guided in boxes secured to the end carline and side walls of the vestibule. The spiral compression springs are located on these stems between shoulders formed on them and the ends of a pair of vertical levers which have their fulcrums on the side walls and whose upper ends are connected by short chains to the ends of a horizontal equalizer which in its turn is fulcrumed to a timber framed in above the end plate of the car. This cross-timber and the brackets forming the side walls of the vestibule are substantial and securely fastened with corner irons and bolts. The connection between the vestibule plate and the framing of the vestibule is made with heavy sheet rubber which is shaped like the folds of an accordian.

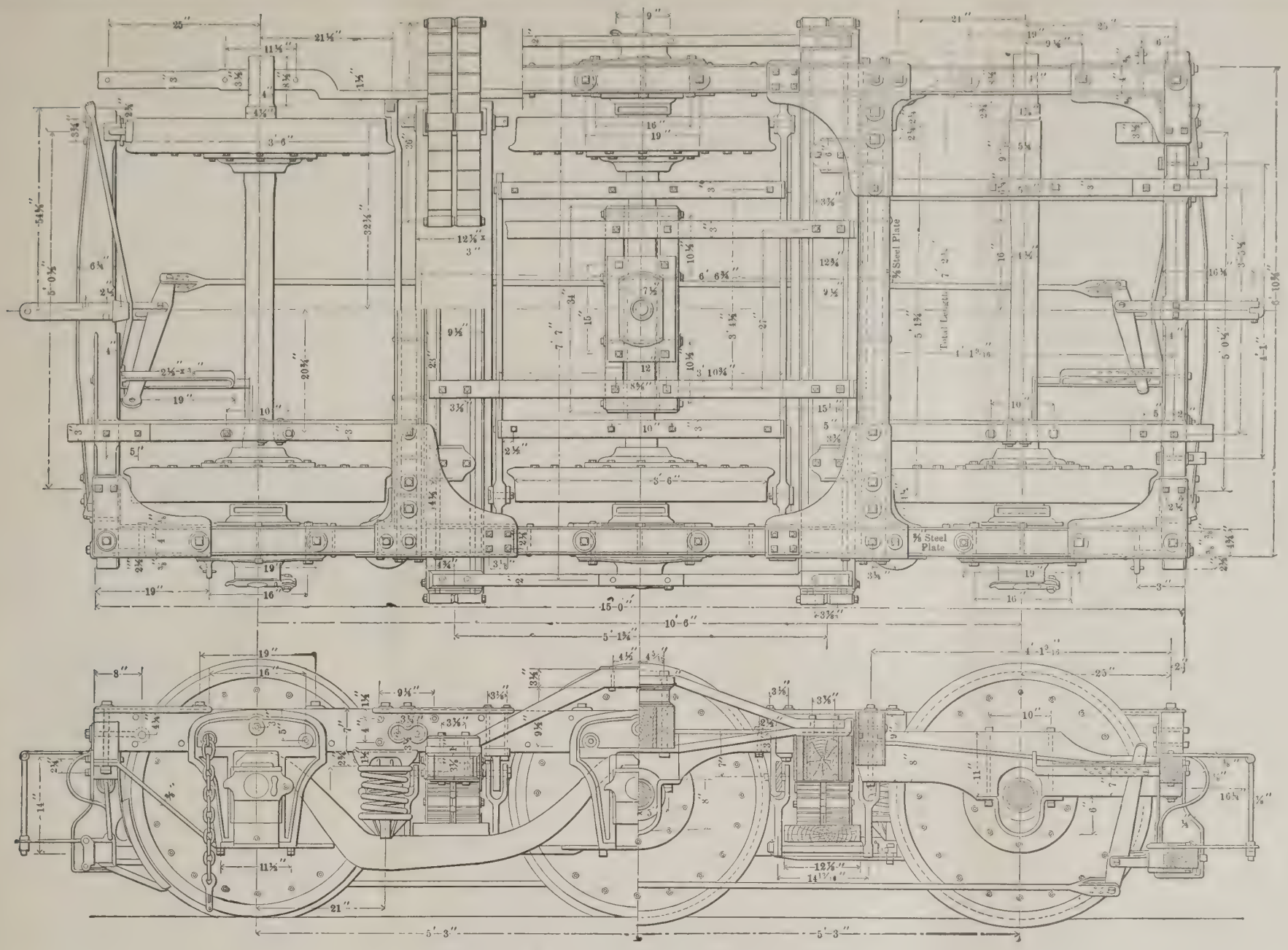
The ceiling of the vestibule is dome-shaped and is furnished with a lamp; there are also provisions for ventilation, as shown. The doors fold back upon themselves, so as to be less in the way when open. They are handsomely made, with bevel-edged plate glass and brass grills. All the attachments of the platforms are also very elaborate the ornamental railings and brackets, brake wheels, etc., are of polished brass, and the floors and treads on the steps are covered with corrugated rubber mats.



PULLMAN'S PALACE CAR COMPANY VESTIBULE.



PULLMAN'S PALACE CAR COMPANY VESTIBULE.



PULLMAN'S PALACE CAR COMPANY TRUCK.

TRUCKS.

Owing to its great weight the Pullman cars are mounted on six-wheeled trucks, which are equipped with 42-inch steel tired paper wheels; this large size wheel is preferred for the reason that it improves the riding of the car and also diminishes the annoyance from hot boxes.

The wheels are pressed on axles having collarless journals, the boxes being fitted with the well-known Bissell end-stop and wedge; the bearings are ample, the journals being 4 inches × 8½ inches.

To accommodate so large a wheel the truck frame is of necessity very large; its length, exclusive of brake beams and other projecting parts, is 15 feet. It is framed as is customary with this class of trucks; the wheel beams, which, like all the timbers in this truck, are of well seasoned white oak, are 4⅜ inches × 7 inches, which dimensions include the ⅜-inch steel plates with which the beams are reinforced. These plates are secured with ½-inch button headed bolts wherever the pedestal and other attachment bolts do not serve this purpose.

The transoms of 4½ × 9-inch oak are also strengthened by the addition of a pair of ⅜-inch steel plates each; these plates are turned at right angles where they meet the wheel-pieces, a pair of ¾-inch bolts passing through each of the feet thus formed, serve to fasten them, the usual mortises, which to a great extent weaken the wheel-beams, are thus avoided. To further strengthen the joints, but principally for the purpose of bracing the frame, cast steel plates having flanges which engage with the edges of the beams and transoms, are provided and fastened as shown. The transom truss-rods are let into the sides of the timbers before the steel plates are applied. The two iron transoms are forged from 1 × 5½-inch bars, have projecting bosses where the swing hangers are attached, and are secured by four ⅝-inch bolts to each wheel beam.

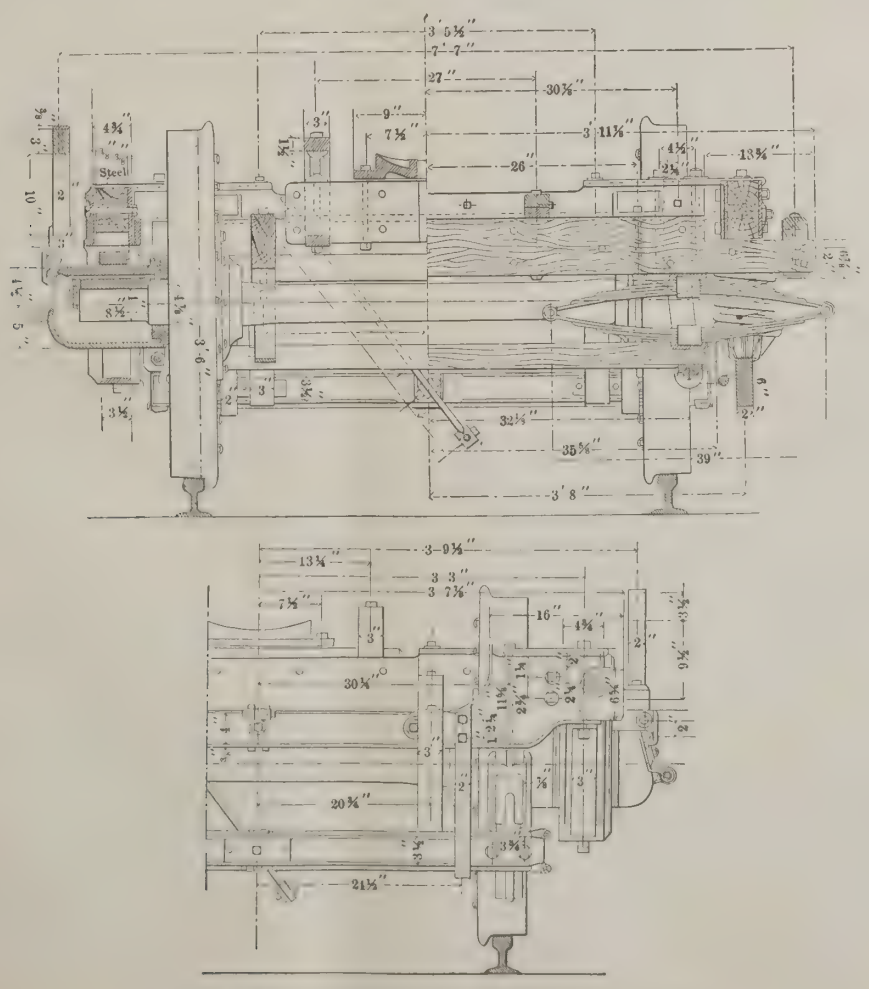
As the trucks, owing to the large size of the wheels, stand very high, the center portion of the end sills is cut away nearly 8 inches to make room for the draw gears of the car, and as they are 4 inches × 4 inches at the center when finished, their original size is 4 inches × 11⅜ inches; this does not include the ⅜-inch straps which are applied to their lower edge and extend from end to end. At the corners, where they join the side timbers, there are plates similar to those at the transoms in addition to the ordinary fastenings.

There are the usual axle safety beams, those at the ends being 3 inches × 11 inches and those for the center axle 3 inches × 8 inches. The latter are attached to ¾-inch × 3-inch iron straps, which are secured to the iron transoms.

The swing hangers are located as far apart as is practicable; the distance between them is a trifle over 5 feet at the top and 4 inches more than this at the bottom. The 3-inch × 13-inch spring planks rest by means of suitable castings on the lower hanger pins and carry the elliptic burden springs, which are 36-inch couplets and have five 11/32-inch × 4-inch plates.

The swing-beams are 7 × 9½ inches which includes the two ¾ × 7-inch iron flitches and a ⅜-inch steel plate on their inner face; they extend from under and beyond the wheel-beams a sufficient distance to carry the side bearings which the large wheels do not permit to be applied in the usual places. The center-beam is 7 × 12 inches and is also constructed with two ¾ × 7-inch flitches; it is carried by two iron trusses made with 1¼ × 3-inch tension and 1½ ×-3 inch compression members, the depth of these trusses being increased to 10 inches by the addition of cast iron bridges. The frame rests on four 8 × 8-inch round bar equalizing springs which are placed near the transoms and are carried on 2 × 6-inch equalizers. To make room for the ends of the latter, pockets are cut through the pedestal, and into the lower edges of the wheel-beams.

There is nothing out of the usual practice about the brakes that requires special description.



PULLMAN'S PALACE CAR COMPANY TRUCK.

According to the special consular report on coal and coal consumption in Spanish America, English coal is almost exclusively used there, the prices ranging as follows: In Argentine, $12 to $14 a ton; in Brazil, $10 to $16, and in Uruguay, $12 to $13 per ton.

Coal Consumption of Locomotives. I.

BY GEORGE H. BAKER.

(Management.)

The coal consumption of well built locomotives, doing equal work, depends more upon the kind of management the engines have by their crews than upon any other influence.

With locomotives built according to the customs of the present time, the widest field for further improvement in their efficiency is in securing the best possible management.

Many, but not all, of the large American roads recognize this and appreciate its importance, and have adopted various plans to secure careful and economical management of their locomotives. The "Premium" plan has its advocates and is in operation on some roads. By this plan a portion (generally half) of the value of the quantity of coal used, short of what is considered a fair consumption for the work done, goes to the crew of the engine as a reward for careful management, and as an inducement to continuous careful efforts to economize. Say that on a certain division of a railroad 6 lbs. of coal per freight car hauled one mile is considered a fair coal consumption for the work done, and that a locomotive crew, by careful work, succeed for a month, running 100 miles each day and pulling 20 car trains, in burning but 5.5 pounds of coal per car per mile. This will effect a reduced consumption of 1,000 pounds of coal per day for that engine, possibly quite easily accomplished. At the end of the month's work, at this rate, a saving of 15 tons of coal will be accomplished. Under the premium plan half the value of this will go to the crew who effected the saving, and half to the company. If the coal costs $2 per ton on the tank the company will have saved $15, and the engineer and fireman will each have earned $7.50. The $7.50 earned by the engineer and fireman respectively, is, of course, clear gain, and was earned not by more work, or harder work, but simply by *careful* work. Indeed, the work of the fireman was rendered much easier by his not having to handle the 15 tons of coal saved. Instead of shoveling six tons of coal per day he had only to shovel five and a half tons, and thus in the month's service he was spared as much work as otherwise he would have had to do in a round trip and a quarter over the division—without compensation.

The $15 saved to the company is not all clear gain, for some part of it must go to pay salaries of extra clerks and office expenses made necessary in order to keep a more minutely correct record of the coal consumption of the engines, mileage of cars and amounts of premiums due the men than would otherwise be the case. What proportion of the saving effected by the decreased coal consumption is thus absorbed by increased office expenses depends, of course, upon the amount of extra office work made necessary. But that it is considerable, and that it may in some cases be very large, is evident from the fact that some roads, anxious to economize in fuel in every practicable way, have yet decided, after serious consideration, not to try the premium plan. Another objection urged against this plan is that enginemen may sometimes become more interested in saving coal—making money for themselves—than in getting trains over the road on time, and thus lower the efficiency of the whole road.

The advocates of the plan claim that a money consideration is what is necessary to secure the best management, and induce the men to be continuous in their efforts to economize, and disregard the criticism of associates.

The fear of the criticism of their associates doubtless prevents many engineers from operating their engines as economically as possible. Unfortunately a display of zeal for the interests of a railroad company too often brings men in either branch of train service into disfavor with their associates. A "company's man" is generally looked upon with suspicion by his fellows, although it is hard for any unbiased intelligent person to understand why *any* enterprise should not have the hearty co-operation and earnest zeal for its best success of *all* connected with it, or dependent upon it. It is held that the premium plan is a strong incentive to induce enginemen to be careful and economical, and at the same time relieves those who try the hardest and do the best from criticism, because it is known and understood that they are simply working for the benefit of their pocket, and not the favor of superior officers as might be otherwise supposed.

The plan of educating the enginemen in matters of economical management has grown in favor and adoption during the past two years. In some cases this is confined to instructions to the firemen about the use of fuel and the principles of combustion, and in other cases the instructions cover the whole field of economical management as it is affected by the fireman in firing, and the engineer in running the engine.

The more liberal instruction results from the growing belief that it is the engineer upon whom depends mostly the economy of the engine instead of upon the fireman as was supposed. Much depends upon the fireman, his knowledge of the principles of combustion, and his intelligence and judgment; but much more depends upon the engineer who exercises full control over the whole operating of the engine. While the fireman can save coal by the exercise of care and good judgment in the management of his fire, yet the engineer can save coal by operating the engine so as to greatly reduce the demands upon the fire.

The premium plan assumes that the practical experience of the men has taught them the best methods of economizing fuel, and that what is necessary to cause them to exercise this knowledge in daily practice is a money incentive.

The educational plan undertakes to instruct in economical methods of firing, boiler feeding, and use of steam; and, in doing so, to point out the errors of wasteful practices indulged in by those of the oldest experience; such as, in firing, neglecting to keep the bed of fire thin and the grates free from ashes and clinkers for the free supply of air to the fire, blowing off steam through safety valves, unnecessary and objectionable emission of smoke, and many other points; and, in running, injudicious boiler feeding and use of steam.

Both of these plans are excellent means to accomplish the desired object—economical management—and the operation of each has in many cases secured results very gratifying from every standpoint. It is probable that the very best results would be obtained by a union of the two plans—by education, giving the clearest possible conception of the many influences at work during the process of the production of heat and the conversion of its force into useful work; and by premiums, encouraging the exercise of intelligence, care and economy in daily practice. Education should be the first step, and the inducement of premiums used to encourage and keep alive interest in the matter.

In the questions and answers following, the instructions of one method of education in this matter that has proved highly successful in practice are briefly stated.

Q. 1. What is the source of a locomotive's power?

A. Heat.

Q. 2. By what process do we get the heat for an engine's use?

A. By the combustion of fuel.

Q. 3. What is coal composed of?

A. Carbon is the chief ingredient. Hydrogen, nitrogen oxygen, sulphur and ash are the others.

Q. 4. What is air composed of?

A. Two invisible gases, oxygen and nitrogen.

Q. 5. How does the union of oxygen and carbon cause heat?

A. Heat is generated by the *clashing together* of the atoms of the oxygen and those of the carbon and gases of the coal.

Professor John Tyndall, one of the highest authorities on matters of Natural Philosophy, says of this: "It is to the clashing together of the oxygen of the air and the constituents of our gas and candles that the light and heat of our flames are due. When steel filings are scattered in this Bunsen's flame you see the star-like scintillations produced by the combustion of the steel. Here the steel is first heated till the attraction between it and the oxygen of the air becomes sufficiently strong to cause them to combine, and these rocket-like flashes are the result of their collision. It is the impact of atoms of oxygen against atoms of sulphur which produces the heat and flame observed when sulphur is burned in oxygen or in the air; to the collision of the same atoms against phosphorus are due the intense heat and dazzling light which result from the combustion of phosphorus in oxygen gas. It is the collision of chlorine and antimony which produces the light and heat observed when these bodies are mixed together; and it is the clashing of sulphur and copper which produces incandescence when these substances are heated together in a Florence flask. In short, all cases of combustion are to be ascribed to the collision of atoms which have been urged together by their mutual attractions."

This point has been enlarged upon so as to make clear the absolute necessity of a free supply of air to the fire, since its existence depends upon the same quite as much as to the supply of fuel put upon the grates. Indeed it shows the truth of what has often been said: that the oxygen of the air is just as much the *fuel* of the fire as the coal or wood we throw upon it—each is consumed and goes to form a new substance—carbonic acid, carbonic oxide, or water.

Q. 6. Does much depend upon what amount of air is admitted to the fire?

A. The heat of the fire depends. Practically about 300 cubic feet of air is needed to pass through the firebox to effect the best combustion of each pound of coal put upon the fire. We may then have perfect combustion—the carbon of the coal burning to *carbonic acid*, and the hydrogen gas contained in the coal burning to *vapor of water*—yielding about 14,000 units of heat for each pound of coal consumed. Unless this amount of air is admitted, we will usually have imperfect combustion—the carbon of the coal burning to *carbonic oxide*—and yielding but 4,452 units of heat, or nearly 10,000 units of heat less per pound of coal (less than one-third) than when there is a sufficient amount of air admitted to the fire, and consequent perfect combustion.

Q. 7. What must a fireman do to secure a free admission of air to his fire?

A. He must keep his fire thin and sufficiently free from ashes and clinkers to admit a free supply of air.

Q. 8. Can too much air be admitted to the fire?

A. Yes. All admitted in excess of that needed to effect the best combustion simply has the effect of absorbing the heat of the fire and carrying it off.

Q. 9. What is necessary to prevent access of too much air?

A. The bed of fire on the grates must be kept sufficiently thick to prevent access of too much air; or, when the fire is new and clean, by restricting the admission of air to the ash pan by means of the dampers.

Q. 10. Does the size of a lump of coal affect its burning

A. Yes.

Q. 11. Why?

A. Because its rapid combustion depends upon the amount of *surface* it exposes to the action of the fire. By breaking a large lump of coal into small pieces we greatly increase the exposed surface.

Q. 12. To what size should lumps of coal be reduced?

A. As near egg size as possible, especially with soft coal.

Q. 13. Should a fire be put in before starting, or while starting?

A. Just before starting in firing with soft coal when the fire is in good condition. When the fire is low, or in firing with hard coal, the charge of fuel must be put upon the fire in sufficient time, and, if necessary, the blower used judiciously to have it burning well before starting.

Q. 14. What are the results of putting coal in while the engine is starting?

A. Waste of fuel, lowering of steam pressure, and consequent chilling of boiler, especially of the flue sheet.

Q. 15. How should the coal be thrown upon the fire?

A. It should be scattered nearly even over the surface of the fire, favoring the sides and corners.

Q. 16. Should a fireman anticipate the work his engine is about to do?

A. He should. This is very important. Firemen should *think ahead*, and regulate the supply of fuel to the fire to conform not only to its present needs, but to suit the conditions that will probably obtain before the fuel being put in has yielded up its entire heat. A fireman should be continually anticipating and thinking ahead of the nature of the work the engine is going to do, and the conditions that will prevail from the start to the finish of the trip. Before starting from stations he should anticipate the fierce draught of the full stroke exhausts, and therefore get his fire in before the engine starts, so as to avoid the evil and wasteful effects of having the fire door open while the draft is strongest. And he should be governed by the conditions that prevail when the height of water in the boiler is sufficient to allow of running the first half-mile, or the first mile, without the use of the injector. He should be particular at such times to not make his fire so hot as to cause the steam pressure to reach the blowing-off point, and thus force the engineer to put on the injector before he desires to, or before it is necessary. Much unnecessary consumption of coal results from firemen neglecting this very important point.

Q. 17. What are the best ways to prevent popping?

A. 1st, by restricting the supply of fuel to the actual need of the fire; 2nd, by dropping the dampers; 3rd, by starting the injector, or, if it is working, by increasing the feed; 4th, by turning steam back into the tank through the injector not in regular use.

Q. 18. Why does dropping the dampers decrease the heat of the fire?

A. Because the air—the other part of the fuel—is then shut off from the fire, and combustion partly suspended.

Q. 19. What is smoke?

A. Smoke is the unconsumed gases of the fuel. If they had burned perfectly—to carbonic acid—or imperfectly—to carbonic oxide—they would in either case have been invisible. Generally when smoke is being produced our furnace is acting the part of a gas retort, and expending a large amount of heat for the volatilization of the gaseous part of the coal, and allowing it to escape without giving any return.

Q. 20. Why should smoke be prevented?

A. For economical reasons—because it is a source of loss; and for political reasons—because it is annoying to the patrons of the road.

Q. 21. What is best to do to prevent smoke?

A. Admitting pure air above the fire. When steam is shut off approaching a station smoke should be prevented by this means, as at such times it is likely to be especially objectionable to passengers, as it is not thrown away from the train by the force of the escaping exhausts, and naturally drags along the top and sides of the train and enters the coaches. Generally, especially with bituminous coal, air admission above the fire in quantities to suit, by whatever means may be provided or ingenuity suggests will abate or prevent smoke and save coal.

Q. 22. Within what limits should the steam pressure be kept?

A. Within the limits of 10 pounds; and it should not be allowed to vary rapidly either way.

Q. 23. What condition must the fire be in before the blower is used?

A. Over the entire grate surface, and especially over the *forward portion and next the flue sheet.* This is very important for the preservation of flues, as when the blower is used when the grates are bare of fire in front the cold air that enters there is very injurious to the flues and flue sheet, and almost invariably causes annoying and wasteful leaking.

Q. 24. How should the blower be used?

A. Always as lightly as possible to effect the desired purpose.

(*To be continued.*)

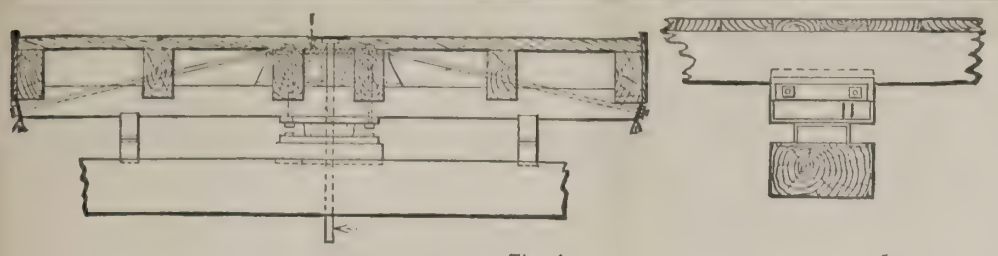


Fig. 1.

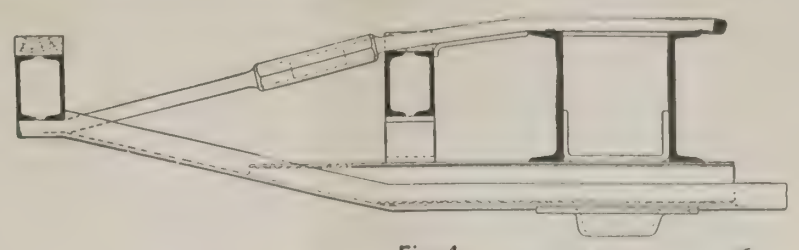


Fig. 4.

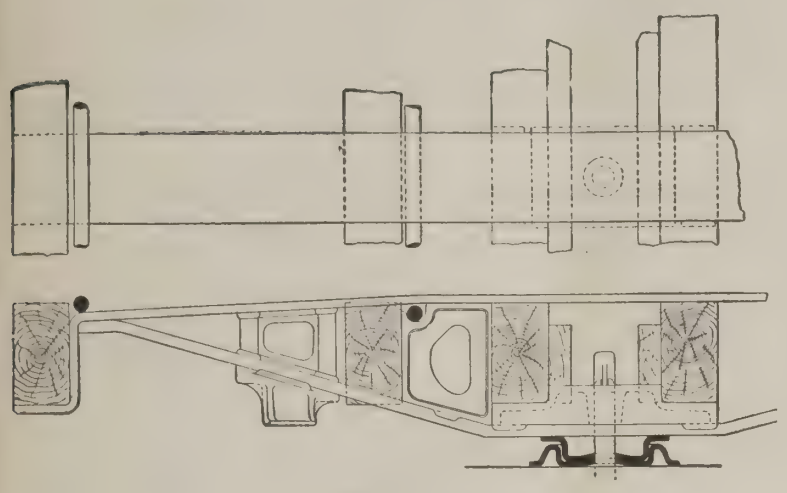
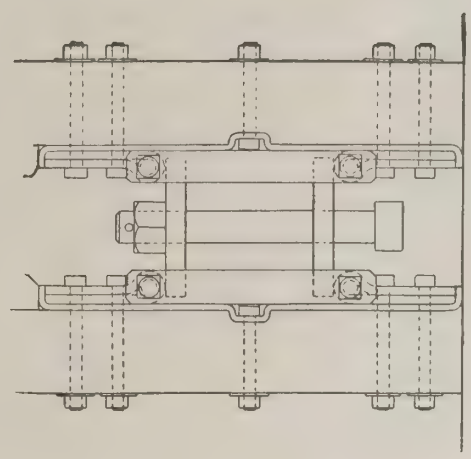


Fig. 2.



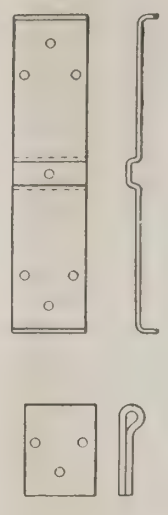
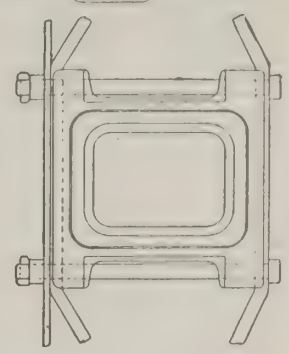


Fig. 8.



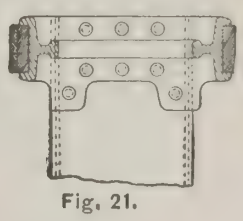
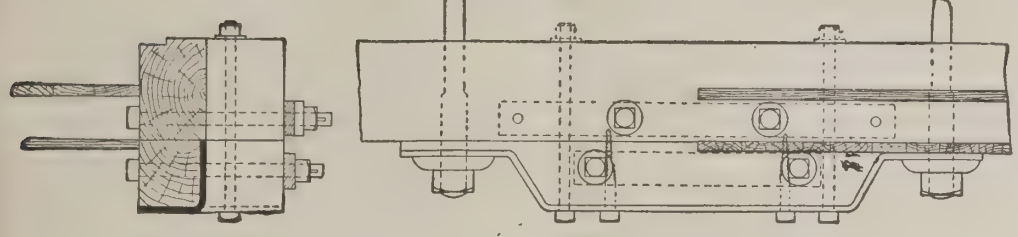


Fig. 21.



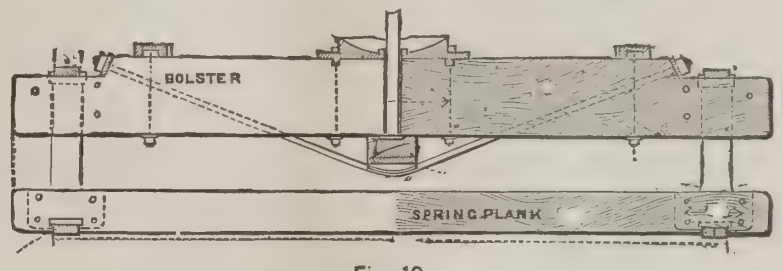


Fig. 19.

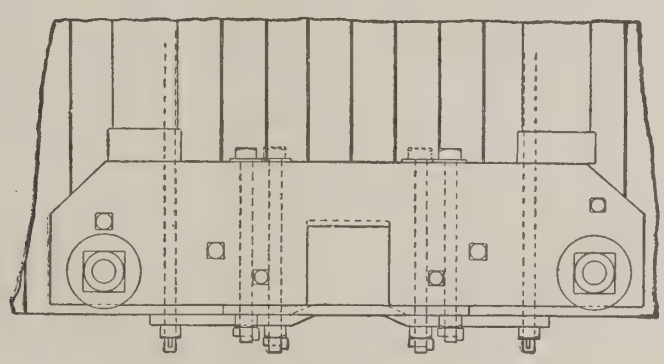
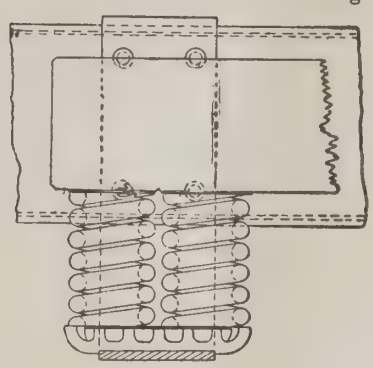


Fig. 10.



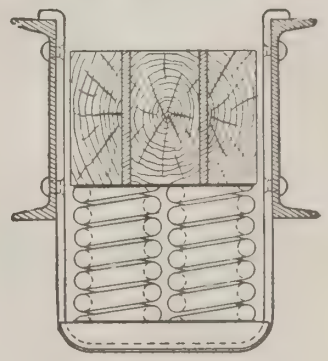


Fig. 20.

RECENT PROGRESS IN CAR CONSTRUCTION.

Recent Progress in Car Construction and Design.*

The freight car in use twenty years ago was in appearance not unlike those we now use; but the difference in construction is considerable. The most important change has been, of course, in the increase of capacity. The old cars were adapted to carry 24,000 pounds, and weighed 20,000 pounds, or 8–10 pounds of dead weight per pound of rated useful load. The present car weighs about 30,000 pounds, and has a capacity of 60,000 pounds or 5–10 pound of dead weight per pound of rated useful load. The car of twenty years ago had a capacity of 1,000 cubic feet, or about 20 pounds of dead weight per cubic foot, or a rated capacity of 24 pounds per cubic foot. The recent cars have a capacity of nearly 2,000 cubic feet, or 15 pounds of dead weight per cubic foot and a rated capacity of about 30 pounds per cubic foot. From this it is seen that there has been 37 per cent. decrease in dead weight of box freight cars per ton of full rated load; 25 per cent. decrease in dead weight per cubic foot of capacity, and 25 per cent. increase in the full rated load per cubic foot of capacity.

These are the general improvements in capacity and dead weight which affect directly the cost of transporting freight. The changes in the details are somewhat as follows:

Fig. 1 shows the arrangement and size of sills formerly used, and Fig. 2 that which is now acceptable. The comparative dimensions of sills are 4 × 7 inches and 5 × 9 inches. The increase in the amount of material in the sills and the use of iron in the body bolsters has been compelled by the increase in the severity of service to which the cars are put. Probably nothing illustrates this so well as an examination of the sills and draw bar attachments which have been taken out of light cars in the last five years. The wood removed is the best that the market affords; it is generally good seasoned oak with little or no decay. The repairs have consisted in replacing good material which is broken by good material which is not broken. In other words, repairs have not been made by replacing worn-out or decayed material, but by removing parts that are too weak, and therefore broken, and replacing them with parts having the same weakness, but unbroken. We must conclude from this that the material which has been put into the cars has not given the service which it should. An ideal car would be one that breaks or needs repairs only as the material decays or is worn out, except in the case of wrecks. Train wrecks are not the cause of the majority of repairs to underframes of freight cars. The severity of ordinary service is the main cause, and this will not be less in the future. Locomotives are being made heavier and trains longer and more cumbersome to handle, and it is not to be expected that the engineers running locomotives will be more careful than they have been. On the contrary, the introduction of air brakes and automatic couplers will make engineers even more reckless. They will know that the trainmen are not between the cars at the time of coupling, and they will perhaps, therefore, be less careful about the speed at which couplings are made. The speed at which couplings are made is the one feature of service which most affects the life of car under-frames.

Wooden under-frames have been increased until the limit is reached. They are now as heavy as it is economical to make them. Formerly they were made about 4 × 7 inches. They are now 5 × 9 inches. The weight of wood has been so much increased that a steel under frame having more than twice the strength of the best wooden frame can be made that will weigh only about one-half as much, and the saving in the total weight of the car is about 16 per cent., or 5,000 pounds. This means one average loaded car in every 10 or 12 cars in a train; hence the saving in cost of hauling the 5,000 pounds per car is considerable.

Metal under-frames are now common in all parts of Europe. In Mexico steel or iron sills are now generally used for both passenger and freight cars, with a large reduction in the cost of repairs. In this country a private company started several years since with the iron pipe car sills. All who are connected with railroad repairs know the difficulties of repairing cars of this form. The construction of this type has almost been stopped, and few, if any, railroad companies own such cars. In general they are owned by private companies. The experience with these sills showed that there were less repairs to make, but it cost more to make them.

A few cars have been built in this country with an under-frame made of wood with iron plates on each side. The plan has no real value, as both the wood and metal are cut away with the large number of rivets necessary to hold the parts together. A composite car sill will not answer.

The Harvey plan for steel under-frames for freight cars is probably the best that has been used here. It consists of double channels for intermediate and side sills and a single large channel for center sills, as shown in Fig. 4. These first cars built by Harvey had double center sills similar to the side and intermediate sills shown, but they were not found to be strong enough, and the designs were changed to be as shown. A considerable number of these cars have been built, and so far there have been no reports of failures of the large center sills. In a recent test to show the comparative strength of the ordinary wooden frame and the steel frame on the Harvey plan the wooden frames were broken, and the steel ones remained intact.

One fact that makes this subject an interesting one at the present time is the great reduction in the price charged for rolled steel beams for car construction. Formerly the price was 3½ cents per pound, or $70 per ton. It is now less than two cents per pound, or less than $40 per ton; so that now a car can be constructed with a metal under-frame for about $10 additional cost and about 5,000 pounds saving in total weight.

There is already some controversy regarding the best methods of construction of steel frames. One of the most disputed points is whether a bolted or riveted frame is better. A little reflection will show that with proper apparatus a rivet can be placed in position quicker and will fill the holes better than a bolt. Generally a rivet can be taken out quicker than a bolt can be removed if the nuts fit as they should. For this class of work the nut should fit the bolt so closely that it would require a wrench to turn it on the entire distance; otherwise they will rattle loose and come off.

When metal under-frames are generally used there will need to be a different class of tools for repairs than is now used for wooden frames. The experience in all foreign countries is that, except in the case of bad wrecks, but few running repairs are necessary. Periodically the cars are inspected for loose joints and deterioration, and in Germany the great durability of the metal frame has enabled the reduction of the car repairs to such a complete system that a record of the condition of each car is kept, and repairs are only made when ordered from headquarters. There are no small repairs, such as the renewal of draught timbers, transoms, bolts, etc. Generally the work consists of a complete overhauling of the superstructure, roofs and buffers. The under-frames are now, after 15 or 20 years' use, in as good condition as when first put in service. The limit of life of a steel under-frame has not been determined. It has been estimated, however, that unless the development of the service demands a change in the design of cars the life will be from 50 to 80 years. This could not be true of stock and refrigerator cars unless some means were provided for keeping the moisture away from the tops of the sills.

The introduction of steel for car framing here has been hindered by the enthusiasm of those who have proposed it. Generally they have advocated a too radical change, such as the construction of steel floors, linings and sidings. The time has not come for these, and it is doubtful if the American method of railroad operation will ever permit the use of a steel floor. A wooden floor is necessary in order that cleats and braces may be nailed thereon to keep merchandise from shifting in transit. A metal superstructure, floor siding and lining will not be generally used until long after metal sills are common.

Probably the advance in construction of the body bolsters is as marked as that of any other detail of freight cars. Formerly they were made of a single piece of timber, as shown in Fig. 1. Such bolsters served admirably at the time they were made, but they soon became inadequate to withstand the shocks of service, and naturally enough an iron bolster was used. The latest and best form is that used by the Chicago, Burlington & Quincy Railroad. See Fig. 2. The ends of the top member of the body bolster are bent down to carry the side sills, as shown. This is probably the strongest form of body bolster now used. The introduction of metal under-frames will necessarily change considerably the detailed construction of the bolster, as a wide bolster is of great assistance in keeping an under-frame square. Always in riveted work the thinner the sheets the better the rivets will hold, and a wide thin bolster is more secure than a narrow thick one; it has more rivets, and the rivets can be made to better fill the holes.

The most expensive detail in point of repair is the draft rigging. The old form with cast iron stops secured to the wooden sill by means of bolts is practically worthless now. It will not stand ordinary service without fracture. When it breaks the result is almost invariably broken or splintered sills. Since the time this was generally used there have been many changes. Probably the first was the use of projections cast on these stops which were inserted in recesses formed in the sides of the sills. Then both stops were cast in what is equivalent to one piece of cast iron. Cast iron was found to be inadequate, and malleable iron, wrought iron, pressed steel and cast steel are now generally used instead. In general all latter forms of drawbar stops are made in one piece and have a wide bearing on the sills. In this way there is more than double the security of attachments between the stops and the sills, and more than double the resistance to the blows and shocks on the drawbar.

To show the comparative value of the new and the old, it is only necessary to state that the modern draft gear never breaks; it bends, and the resistance to rupture when attached

(*Continued on page 45.*)

*Abstract of paper by D. L. Barnes read at Western Railway Club.

Notes on Locomotive Counterbalance.

BY ARTHUR T. WOODS.

In connection with an investigation of some of the effects of the inertia of the reciprocating parts of locomotives, some of the results of which were published under the caption, "Notes on Locomotives for High Speeds" in the January number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, some peculiarities in the relations between the reciprocating parts and the counterbalance were noted which may be of interest.

During the back stroke of a locomotive in forward motion, that is when the crank-pin is below the center line and steam is acting on the forward face of the piston, the vertical forces which are acting in a main driving wheel are (1) the vertical component of the pressure transmitted through the connecting-rod, which in general presses downward, (2) the pressure due to the inertia of the crank end of the connecting-rod which is also downward, and (3) the vertical component of the centrifrugal pressure due to the counterbalance, which is upward. The first includes the pressure of steam on the piston and the pressure necessary to accellerate the piston and rod, the cross-head, and the cross-head end of the connecting-rod. To determine the acceleration effects an exact calculation is necessary by the methods given by Prof. Jacobus in a paper read before the American Society of Mechanical Engineers to which reference has previously been made. Using the data and results given in this paper, the values for the curves shown in the accompanying diagrams have been calculated. The locomotive used in Prof. Jacobus' calculations had 18½ × 24 cylinders, and the weights of the reciprocating parts were as follows: Piston, piston-rod and cross-head 474 pounds, and connecting-rod 307 pounds. Fig. 1 has been constructed from these data and the indicator card used in the paper referred to, for which the initial pressure is about 120 pounds and the cut-off at about 9¼ inches. In calculating the counterweight, one-half of the weight of the connecting rod has been taken as a revolving weight, and the weight of the piston and rod, the cross-head, and one-half the connecting rod has been regarded as "reciprocating weight." The main wheel counterbalance is the equivalent of one-third this reciprocating weight plus the revolving weight. The weights of the crank pin and hub and the side-rod do not enter into the problem, as they are purely revolving weights, and hence can be perfectly balanced in all positions. The resultant vertical effect of the forces due to these quantities at 250 revolutions per minute is shown by the full line curve 1 1 in Fig. 1. In this figure the ordinates above the base line 0 0 represent *upward* pressures tending to lift the main wheel from the track, the scale of total pressure being as shown on the diagram. It will be noted that the maximum lifting tendency of about 2,000 pounds is found at from 120 degrees to 140 degrees from the forward dead point, and not at 90 degrees, where the maximum for the counterweight alone would be found. A similar action is, of course, taking place in the other main wheel. If the latter is supposed to lead the former by 90 degrees, the combined lifting force on the main pair of driving wheels is as shown by the curve 2 2 2, which shows a maximum of about 3,000 pounds at 50 degrees. If with the same weights and the same indicator card the speed is increased to 350 revolutions per minute, the resultant effects are as shown by the curve 5 5, which shows a maximum of about 5,000 pounds at about 80 degrees. The combined results for both main wheels at 350 revolutions are shown by the curve 6 6 6.

In Fig. 3 are shown the results with the same weights, but with an indicator card in which the initial pressure is about 140 pounds and the cut-off at 5¼ inches. In this figure, as in Fig. 1, the curve 1 1 shows the lifting action in one main wheel at 250 revolutions; 2 2 2 is the combined curve for both main wheels at this speed; 5 5 represents the lifting action in one wheel at 350 revolutions on the assumption of the same indicator card, and 6 6 6 shows the combined effect in both main wheels at this speed. The differences between Figs. 1 and 3 are slight, and are due to the different distribution of the steam pressure on the piston on account of the higher initial pressure and the earlier cut-off in Fig. 3

In both diagrams it is to be noted that the maximum lifting action at the slower speed occurs late in the stroke, at from 120 degrees to 140 degrees, but at the higher speed, as the effect of the counterweight becomes more marked, the maximum is found at about 80 degrees in both diagrams. It would seem to follow that if the action of the counterweight could be moved forward there might be some improvement at the lower speed, but the contrary would be true at the higher speed. To test this, the remaining curves in these two diagrams have been plotted on the basis of the counterweight being moved ahead five degrees. The results are shown by the curves 3 3, 4 4, 7 7, and 8 8, of which 3 3 and 7 7 are for one wheel at the two speeds and 4 4 and 8 8 are for both wheels. In both diagrams a marked improvement is noticeable for 250 revolutions as shown by a comparison of curves 1 1 with 3 3, and 2 2 with 4 4. Comparing curves 5 5 with 7 7 and 6 6 with 8 8, it appears that the lifting action in each wheel at the higher speed is slightly increased, but that the combined action is slightly reduced.

To illustrate the effects of a reduction in the weight of

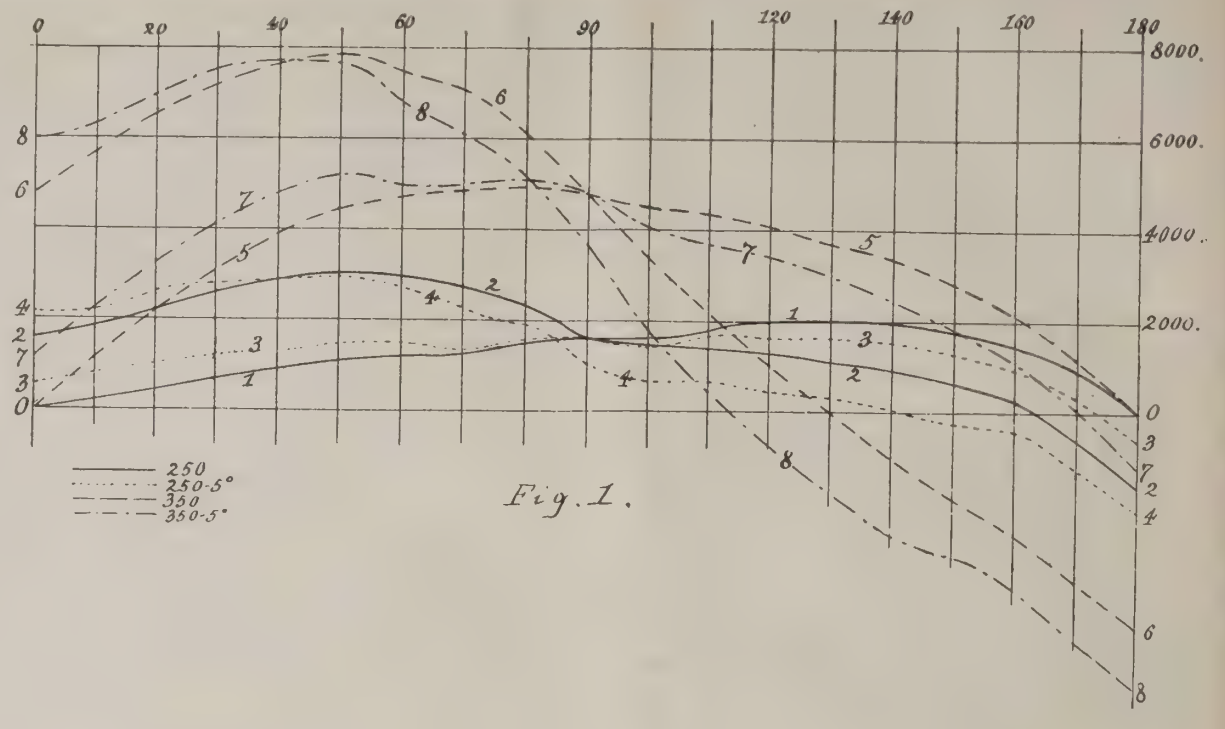


Fig. 1.

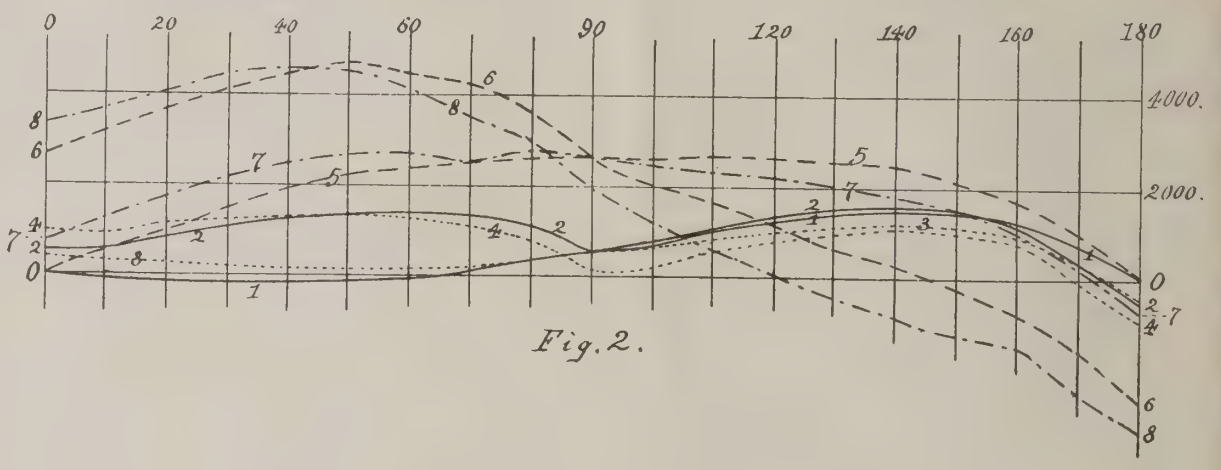


Fig. 2.

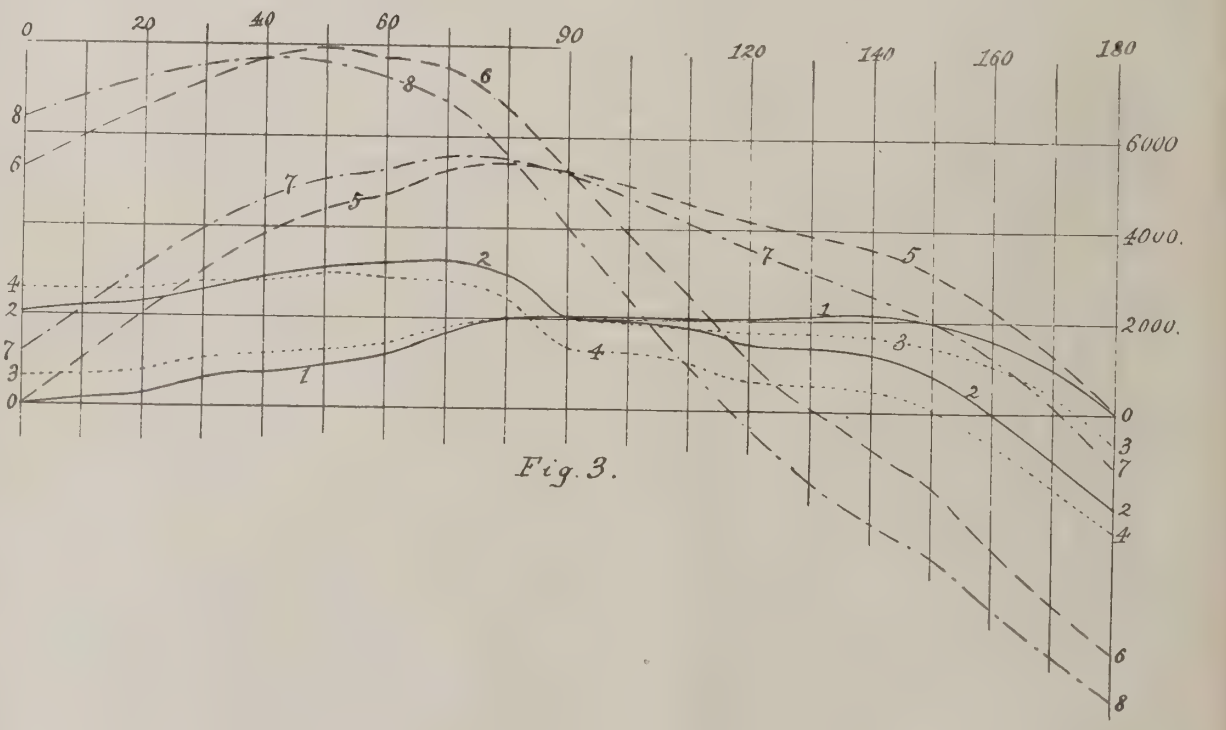


Fig. 3.

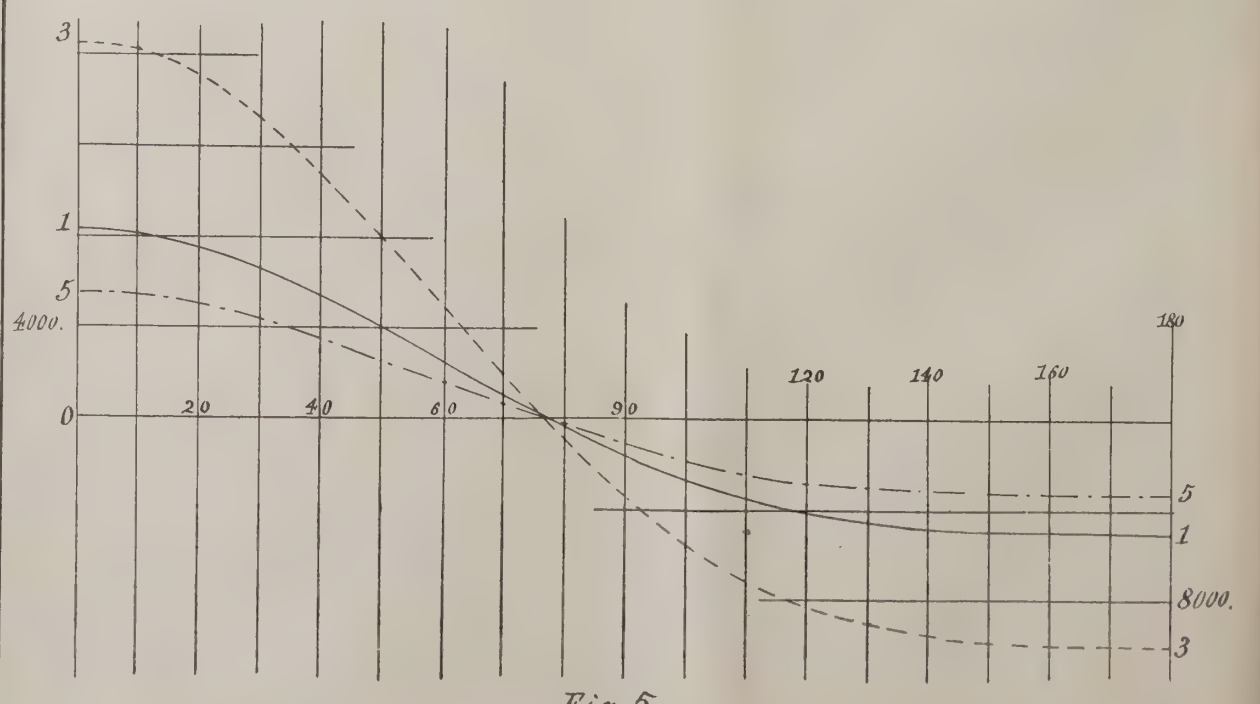


Fig. 5.

reciprocating parts, Figs. 2 and 4 have been constructed. In these diagrams the weight of the reciprocating parts, including the connecting-rod, has been reduced to two-thirds of its former weight, while the proportion balanced and steam pressures have been taken as before, Fig. 2 corresponding to Fig. 1, and Fig. 4 to Fig. 3, the numbers of corresponding curves and the character of lines used for them being the same in all four illustrations. While the general character of the curves has not been changed by the reduction in weights, there are some features which deserve notice. The most important feature is, of course, the obvious great reduction in the lifting tendency. The curves 5 5 show the reduction in each wheel at 350 revolutions to be from about 5,000 pounds in Fig. 1, and 5,400 pounds in Fig. 3 to about 2,700 pounds and 3,000 pounds in Figs. 2 and 4. The combined curves show about 4,500 pounds instead of nearly 8,000 pounds at this speed. From the curves 1 1 in Figs. 2 and 4 it appears that the downward pressure on the crank-pin exceeds the lifting force of the counterweight for about 60 degrees, and that the maximum lifting action occurs somewhat later even than before. It will also be noticed, as shown by 5 5 in Fig. 2, that the resultant lifting action in each wheel is nearly constant from 70 degrees to 140 degrees. Also, that the effects of moving the counterweight ahead 5 degrees are still clearly beneficial at 250 revolutions and of slight importance at 350 revolutions.

As has been said, these diagrams show only the resultant upward pressure during the stroke in forward motion in which the crank-pin is below the center line. During the other stroke, when the crank-pin is up and the counterbalance down, the *downward* pressure will be somewhat in excess of that shown as upward pressure in the diagrams, since the vertical component of the steam pressure acts with the counterweight in this case, instead of against it.

A study of diagrams such as these leads to some interesting conclusions. It is clear that both the speed and the variation in the steam pressure during the stroke greatly modify the lifting tendency of the counterweight and that the sine curve which would represent the action of the counterweight by itself does not at all represent what actually takes place. For instance, treating one-half the weight of the connecting rod as a revolving weight, the lifting tendency of the excess counterweight used in the present case at 250 revolutions would reach its maximum at 90 degrees, and would amount to about 3,360 pounds; but as shown by the curve 1 1, in Fig. 1, the maximum is but about 2,000, and this pressure is very nearly maintained for 20 degrees, from 130 degrees to 140 degrees, and is considerably greater than at 90 degrees.

We also notice that at the higher speed the maximum has also shifted back to about 80 degrees, and it has presumably occupied intermediate positions at intermediate speeds. These diagrams also indicate the importance of a careful and exact analysis of the action of the counterbalance in getting out a new design of locomotive, having due regard to the speed of rotation at which the locomotive will generally run and the most probable point of cut-off. The desirability of keeping the weight of reciprocating parts as low as practicable is obvious.

Such diagrams as these may also serve to throw some light upon the apparent erratic appearance of flat spots on tires. We have seen that the maximum lifting tendency, and hence the pressure on the rail, is found in different positions for different speeds, and also that the tangential or turning effort varies with the speed and steam pressure.*

The greatest tendency to slip occurs when the greatest tangential pressure in proportion to the pressure on the rail is found and the slipping position therefore varies. While it does not appear that all of the flat spots which persistently appear in the same portions of a driving wheel can thus be accounted for, it would seem that diagrams, such as these when made for a given locomotive, might show clearly how a readjustment of counterbalance could prevent the recurrence of some of them.

Thus far we have considered only the vertical components of the disturbing forces acting in the engine, but the horizontal forces are also of interest and importance. These horizontal forces for the four-coupled locomotive under discussion, and with the same data as for Figs. 1 and 2, are shown by Fig. 5. In this diagram the horizontal shaking forces for one cylinder are plotted *vertically* for each ten degrees of a stroke, the scale of the diagram being, as shown on the figure, one-half that of the other diagrams. The curve 1 1 corresponds to 1 1 in Fig. 1, or is for 250 revolutions; 3 3 corresponds to 5 5 in the first figure, or is for 350 revolutions, and 5 5 corresponds to 1 1 in Fig. 2, or is for 250 revolutions, with the weight of reciprocating parts reduced to two-thirds their former weight. In both cases the counterweight is equal to two-thirds of the reciprocating weight. Of course, by balancing a greater proportion of the reciprocating weight the horizontal shaking forces can be greatly reduced. On the basis that the horizontal balancing can be equally well accomplished, practically, by dividing the total counterweight among the driving wheels, or by putting it all in the main wheels, it would follow that the greater the number of driving wheels the nearer we can approach to a perfect horizontal balance with the minimum vertical disturbing forces.

*See NATIONAL CAR AND LOCOMOTIVE BUILDER, January, 1892.

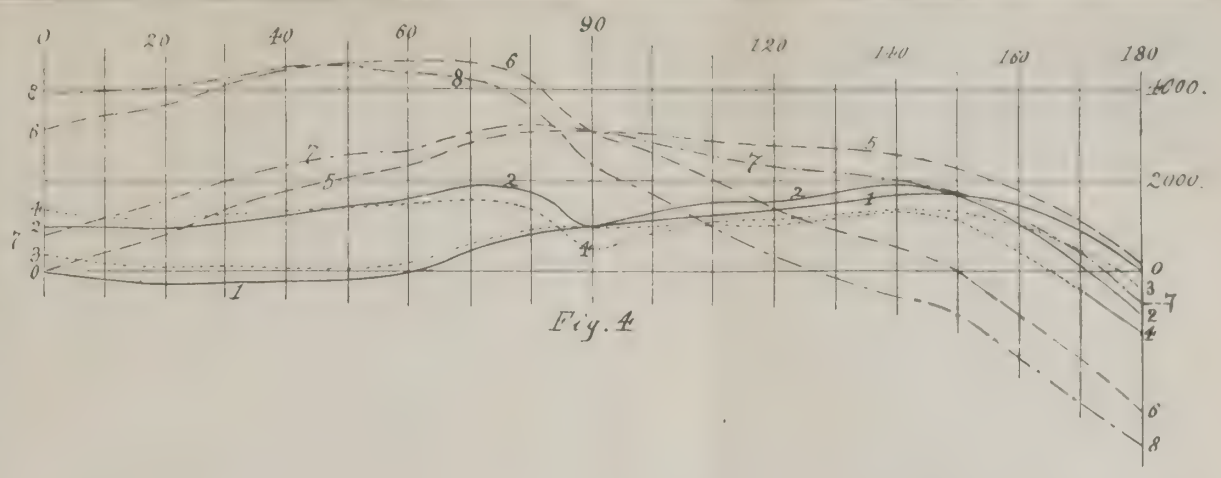


Fig. 4

Notes of Travel.

A visit to the Pennsylvania Railroad shops at Altoona will repay one who may wish to see Industry at home, or witness in operation the most improved tools and methods for doing the work of repair of old equipment and the building of new.

But when it is said that these shops are strung along the tracks for about two miles it will be understood that a visit of one day is insufficient for any purpose except to get a general idea of the vast establishment. Several such visits or several days would be needed before one could begin to take in details for what they are worth. One of the first things to attract my attention was the clean condition of the windows of the different shops and roundhouses. Here, evidently, light is regarded as having a money value, for I noticed men engaged in cleaning windows that in some shops would be considered already unnecessarily clean. The importance attached here to an abundance of light for the workmen was impressed upon me again by hearing a criticism made upon a splendidly equipped shop to the effect that the traveling cranes did not permit of the arc lights used for illuminating after dark of being hung low enough to give the workmen sufficient light.

Cleanliness and order prevailed generally throughout the many departments of the works. The pattern store room, though crammed with thousands of patterns and much in need of space apparently, was in perfect order, with every pattern plainly numbered and catalogued as carefully as books in a well ordered library.

The laboratory, under Dr. C. B. Dudley's care, is well equipped with appliances for carrying on the wide range of tests that are necessary to protect the interests of the company in purchases and in solving many problems that have a direct bearing on the economy of moving traffic One of the most recent branches of inquiry this department has undertaken is an investigation into the merits of the Holmes "lubricant bearing." This is a composition of graphite reduced to a fine powder, freed of all gritty matter, mixed with wood pulp and molded to any desired shape. The Committee on Science and the Arts of the Franklin Institute recently recommended the inventor of this composition to receive the Institute's highest award, the Elliott Cresson gold medal, for the perfecting of a bearing "which possesses the requisite hardness to withstand the usual pressures, and also to offer a surface that, without the aid of oil or other lubricants, will reduce friction to a minimum." It has stood pressures of 50 pounds per square inch, and it is thought at Altoona that it may possibly prove serviceable for lining guides, crossheads, etc.

The new Juniata shops at Altoona devoted to building locomotives, and under the charge of Master Mechanic H. D. Gordon, deserve a day's stay from the visitor instead of the half hour I was able to give. Here everything, from the automatic stokers in the furnace room to the traveling electric cranes that traverse the shops from end to end, is supplied and arranged to facilitate the building of locomotives; and everything, from the clean windows by day and the arc lights by night, to the handsome lavatories, with double rows of porcelain lined basins and clean brass cocks giving warm and cold water, is provided for the comfort of the workmen. I happened into the boiler shop just as a large boiler was ready to be put upon trucks to be taken to the erecting shop, where the frames and cylinders of the engine were in position to receive it. The traveling crane was moved rapidly into position for lifting the boiler, and within two minutes after the arrangements were complete for lifting it the boiler had been raised, lowered upon the trucks and was upon its way to the erecting shop. It had about 15,000 feet of track to go over and two switches to make, yet within 20 minutes of the time it had been picked up in the boiler shop I saw it lowered to its place between the frames of the locomotive whose mainspring of power it was to be.

My interest in this engine did not stop here. The boiler was placed between the frames the last thing Monday evening and the engine was sent to the roundhouse for service the next Monday morning. The actual number of working hours the engine was in the erecting shop was sixty-one. There were several annoying delays on this particular engine that consumed several more hours than usual. The average time of one of these engines in the erecting shop is fifty-nine hours.

Both boiler and erecting shops have electric traveling cranes that get about with great celerity and that appear capable of the nicest adjustment in their movements. There are two of these in the erecting shop and one in the boiler shop. Those in the erecting shop are of 35 tons capacity each and were made by the Morgan Engineering Company. The capacity of the one in the boiler shop is 15 tons and was made by Wm. Sellers & Co.

The Southern Pacific Company are reported as having prepared plans for extensive improvements at Sacramento, costing $1,000,000. A new bridge will span the Sacramento River, and the passenger station will be moved to another site.

A bill appointing a commission of three members to have general supervision over all the railways in the State is before the New Jersey Legislature. The cost of the commission is not to exceed $25,000 per annum, to be paid by the railway companies in proportion to their wealth.

Statistics have been prepared showing the number of cars of freight that were shipped eastward from Kansas City during 1891, and the proportion taken by each road. The figures are as follows: Atchison, Topeka & Santa Fè, 30,924 cars; Burlington, 22,139; Chicago & Alton, 18,827; Missouri Pacific. 15,715; Kansas City, Fort Scott & Memphis, 14,568; Rock Island, 13,880; Wabash, 10,965; Chicago, Milwaukee & St. Paul, 10,671; Chicago, St. Paul & Kansas City, 8,057. This makes a total of 145,746 cars.

A Fyzabad Hindoo has been restored to his caste by the following process of purification: He lost caste eating cooked food in a railway carriage, in which persons of another caste were traveling. He had to pay his own weight first in rice, the value reaching 180 rupees, and then in wheat. After being twice weighed in this way he was made to sit on a square stone, while his body was covered with manure, the face only excepted; he was then taken up by two men and thrown into the river, and after a bath was received by the Brahmins, fully restored to caste fellowship.—*New York Sun.*

Careful investigations made by traffic managers of the Western roads show that about 30 per cent. of last fall's crop has now left the farms and elevators of the West, and has been carried to Eastern and foreign markets. The moving of this part has kept the roads interested in the traffic as busy as they could be for several months and the Eastern roads have been in a state of blockade for the greater part of the time. The blockade has been raised recently, but a number of the roads say that affairs can hardly be said to have resumed their ordinary state, because if the Western roads forced all the grain they could get on the Eastern roads the blockade would become worse than ever. Eastern roads have considerably more cars at their command now than when this traffic began, and it is probable that they will be able to keep things moving until the opening of navigation, when a sufficient outlet will be afforded for all the grain that can be sent. With 70 per cent. of last year's crop still in the West, the traffic managers say that there will be no possibility of light business either by all rail or railroads and lake lines until next year's crops are ready to be moved.

An explosion of benzine vapor at the Baldwin Locomotive Works, Feb. 16, killed two men and seriously injured a third. The dome of a boiler had been removed, and just before the noon hour the men applied a considerable quantity of benzine to bolt and rivet heads inside the boiler to soften the rust and scale. On resuming work one of the men got inside the boiler, and a boiler maker's lamp was lowered to him. A considerable quantity of benzine vapor had probably accumulated in the boiler and mixed with air, for an explosion took place and the body of the man inside the boiler was fired like a projectile straight upward through the dome opening and lodged in the roof trusses overhead. The overhead electric crane had to be run underneath in order to reach him. Notwithstanding severe burns and other injuries, he lived after the accident for several hours. The workman who lowered the lamp into the boiler, and who was standing directly over the dome opening, is supposed to have been struck by the body of the man inside. He was also blown upward, struck one of the roof braces, and fell on a pile of iron plates. He died in a few minutes. The third workman was standing on top of the boiler between the cab and the dome. He was thrown to the ground and badly burned and bruised.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

ELECTRICITY vs. LOCOMOTIVES.

An unusual amount of agitation about substituting electricity for steam in the propulsion of railroad trains has been going on recently. The Northern Pacific people have been investigating the matter, and General Manager Mellen is reported as having sent a number of his locomotive engineers to Boston to study electrical science at the Massachusetts Institute of Technology, and as declaring that his progressive road would be running trains by electricity during the Columbian Exposition.

A committee of Illinois Central directors, who have also been investigating the matter, have reported that "the development of electricity as a motive power has not yet progressed far enough to warrant the company in attempting to use it in place of steam."

The Chicago, Burlington & Quincy in making arrangements to illuminate all their offices, depots and yards at Chicago and Hawthorn were accused of experimenting with electricity with a view of making it the motive power for their suburban service. They promptly denied any such intention and put themselves on record as not believing in the practicability of running trains by electricity either in the present state or possible near future development of electrical science.

But all other railroad electrical probabilities are eclipsed by a project to build a double track railroad "as straight as an arrow" between Chicago and St. Louis on which electric cars will travel at the rate of 100 miles an hour.

"In time the entire line is expected to become a boulevard, the farmers' houses standing on city lots, while behind them will stretch the wheat fields. The houses will be lighted and heated by electricity, and the reapers, mowers and threshers will be driven by it. An electric block system will be operated, and the track will be automatically illuminated a mile ahead and a mile behind each car. Trains which are on the same section will have telephone connection, and communication may be had whether the trains are moving or standing."

The route of this enterprise is to be turned into a veritable Arcadia, for it is said that it has recently been discovered that vegetation grown under the electric light develops sooner, and has about 25 per cent. more vigor than that which depends upon the old-fashioned sunlight, and so the road will be one continuous exhibit of abnormally developed flowers and plants.

While it is true that advances are being made with great rapidity in the knowledge and control of electricity yet the realization of the dream of running heavy trains of cars propelled by it seems far away. Electricity can not be obtained except by being made, and it takes an expenditure of means to make it as it does to make steam. It is a means for the transmission of power, not the power itself, and it is far from having been demonstrated that it can be made either as cheap or efficient as steam for the movement of heavy railroad traffic.

BOILER EXPLOSIONS.

In commenting on the remarks made at the last meeting of the New England Railroad Club about the infrequency of locomotive boiler explosions, we mentioned that there had been three locomotive boiler explosions in January. There were four; another one occurring on the Philadelphia & Reading the day after we had gone to press, Jan' 28, killing five men instantly and making five widows, as all the men were married. Unusual in the number of its victims, the explosion was also unusually severe in mangling the bodies of the men and hurling them to great distances. The conductor and rear brakeman said they saw the bodies of the engineer and head brakeman blown high in the air and land on the side of the mountain 300 feet above the roadbed.

The explosion occurred near Dark Water station, and the press dispatches declare that this is the fourth locomotive boiler explosion that has occurred near there in the past two years. Away from the lines of the Philadelphia & Reading Railroad it is rarely given to the memory of the "oldest inhabitant" to recall four locomotive boiler explosions on the line of his nearest railroad, and rarely to recall one, or over one, in his vicinity.

Another disastrous explsosion occured on the Philadelphia & Reading near Philadelphia on the evening of Feb. 8, killing two men and injuring five others. The boilers, we are informed, were in both cases those of the well-known Wootten type, and in the former case the coroner's jury returned a verdict that "said explosion was caused by numerous defective staybolts in the boiler, that the proper inspection and examination of the boiler was neglected, and that we hold the owners of the locomotive responsible for the loss of life caused by the explosion."

Some of the daily and technical papers are condemning the mechanical officers of the road as being responsible for the explosions and loss of life through carelessness in inspecting the boilers in their charge, but many who are familiar with the type of boiler common on the Philadelphia & Reading know that staybolt troubles have never lost sight of those boilers, and therefore will be more apt to sympathize with than condemn men who, at best, are burdened with a harassing responsibility. We record elsewhere the explosion of a locomotive boiler on the Chicago & Alton road, Feb. 2, killing two men and injuring another.

It is worthy of note that all of the explosions recorded are reported as having occurred while the engine was engaged in very heavy work, pulling or pushing trains up hill.

RAILROAD IMPROVEMENT.

Among the many ways in which the world is continually growing better and giving a broader, fuller and more comfortable life to the civilized people who inhabit it, the advances in railroad improvement during the last quarter of a century is one of great importance. At a dinner given in New York City on Jan. 28, in celebration of the twenty-fifth anniversary of Mr. Chauncey M. Depew's connection with the New York Central system he said, speaking of that system as indicating the growth of American railroads, that in 1866 the average passenger paid, for the poorest accommodations, for dangerous and tardy travel, 2⅞ cents for each mile he traveled; in 1891 he paid 1.96 cents. In 1866 the average charge for a ton of freight for each mile hauled was 4.6 cents; in 1891 it is less than three-fourths of one cent for each ton carried.

In 1886, 125 locomotives, 251 passenger and 1,421 freight cars handled the business of the Vanderbilt lines, and in 1891 the list shows 1,176 locomotives, 1,232 passenger and 42,578 freight cars.

In 1866 these roads extended over only 281 miles of single track, and with double track, sidings and spurs the total was only 463 miles, and the mileage of all the roads in the entire country but 36,827. The statistics of 1891 show the Vanderbilt roads comprise 2,353 miles of single track, and a total of 5,091 of all tracks, and the mileage of all the railroads in the United States 171,117.

The improvements that have resulted in enhancing the safety and comfort of passengers and employés, and in accelerating and cheapening the transportation of all kinds of freight are more numerous than is generally supposed. We devote considerable space in this issue to an account given by Mr. D. L. Barnes of the recent improvements in freight cars, which, although apparently lengthy, is in reality a condensed and interesting recital confined to important freight car improvements. The improvements in passenger cars that have made them safer, more serviceable and comfortable, would be a series of surprises to one who, familiar only with the cars of 25 years ago, could see those of to-day. The common smoking cars of to-day are superior in every way to the then best cars.

Instead of link and pin couplings, slack and long drawbars, that left a leap for life between platforms, usually bridged by a board, we now have automatic couplers, without slack, bringing and holding the platforms close together and with the protecting vestibule over all. In common use are reclining chair cars, carpeted, comfortably warmed and brilliantly illuminated, and with separate toilet rooms and lavatories for men and women, with warm and cold water and all accessories of the toilet. In late designs of such cars we now have a buffet attachment, so that the gastronomical desires of passengers may be satisfied at pleasure. Passengers upon long journeys may enjoy the refinement of luxurious travel in the palace sleeping car; its solidity of construction and flexibility of mounting making motion scarcely noticeable. With a servant in attendance and buffet or dining car service, and a library at command, they may travel continuously for days and nights with great rapidity, safety and entire comfort.

The locomotive improvements have been in the direction of increased safety and general efficiency, economy, cleanliness, and in facilitating management. The more important of these improvements have been larger and stronger boilers, the compound system, injectors, driver and tender brakes under the easy control of the engineer, balanced valves, the brick arch in the firebox, the extension front with open stack of reduced diameter and single nozzle of increased diameter, close notched quadrants, and mechanical and chemical means of purifying feed waters.

It is not probable that any one who never had to grab the "tallow pot" and run out along the boiler to the front end of a locomotive to "oil the valves" every fifteen or twenty miles run, day and night, and in fair and stormy weather, can ever appreciate what an improvement it was when oil cups were put on the boiler head and connected by pipes to the steam chests, thus enabling the firemen to oil the valves aud cylinders without leaving the cab. Yet now these are obsolete, and are generally replaced by sight feed lubricators, which, being filled before starting on the trip, require bnt little attention on the road. The machinery and tools in shops, and the methods of constructing new and repairing old equipment have kept pace with the improvements in cars and locomotives; and so with switches, signals and stations; and crowning all other improvements and rendering possible the accomplishment of their several purposes, and the present safety and celerity of railroad travel and transportation are the improvements in track, roadbed and bridges. The fast passenger train of 1866 made 34 miles per hour, that of to-day averages 51 miles per hour from the Atlantic to the Lake.

WHO IS AN ENGINEER?

In his annual address at the twenty-third meeting of the American Society of Mechanical Engineers last June, the president, Mr. Oberlin Smith, in speaking of engineering and engineers, military, civil, mining, metallurgical, mechanical, etc., etc., said: "It would seem that the profession as a whole should designate its members by the simple word 'engineer.' The public would in time follow this example, but, meanwhile, persistent and organized effort should be made to discourage the "Americanism" of using the word to describe the driver of a locomotive or the engineman of a factory; nay, even the clodhopper who stuffs straw into the fire-door of an agricultural engine, smears lard upon its feverish journals, and hangs his boots and jacket upon the safety valve for a maximum test of the elastic limit of the boiler-shell."

Mr. Smith also favored the February *Engineering Magazine* with an article under the above caption in which it is further said: "All things considered, it would seem that the term engineer, standing simply and alone, would be the proper name for him who practices in the great and growing profession which dominates the civilization and progress of the world, whatever be his specialty. Conflicting with this logical and simple scheme is the absurdity that in our American life the term engineer, which, with eminent fitness applies to men of the highest talent and education, engaged in the most intellectual of pursuits, is also freely applied to men who simply do the mechanical work of attending a steam engine, men who in many cases know but little of its construction, and would be utterly incapable of designing or building it, to say nothing of the higher grades of work beyond."

It is true that we Americans have a good many "Americanisms," one of them being that we call a man in charge of an engine an "engineer" instead of a "driver," as the English do, just as we say "fireman" instead of "stoker," "switching" instead of "shunting," "insoles" instead of "socks," "muslin" instead of "calico," an "elevator" instead of a "lift" or an "ascending room," and so on. Another peculiarity of Americans is that, generally, they do not favor aristocracies, political, social or industrial. They are a democratic people, and regard all legitimate and industrious workers as respectable contributors to the prosperity of the nation, recognizing the members of no trade or profession as of "vastly more importance to the world than those of any other one profession or trade." All are necessary; and work is expected of each according to his or her ability, and paid for according to its excellence.

Engineer, as a word, is more definite than "engineman" and easier to say than "engine-driver;" and people generally will have some difficulty in seeing just why the name should be reserved from workers who can successfully operate engines but cannot build them, to be given to other workers who can successfully build the engines but cannot operate them. This is especially true of locomotive building and running, and it would be an open question if the builder and the runne

should change places which would add the most avoirdupois to the scrap-heap.

There is no question that the men who are skilled in the principles and practice of engineering are, as a class, superior in education and intelligence to the men, as a class, who run engines. But the former lose prestige, and, whether justly or unjustly, have the charge of snobbishness laid at their door when they squabble with the public about the use of "Engineer" to designate others than themselves.

For all the practical purposes of life, Webster's definition of an engineer holds good: "A person skilled in the principles and practice of engineering. One who manages an engine."

REDUCING THE FRICTION OF TRAINS.

Specially interesting to railroad officers who are anxious to cheapen the cost of moving traffic should be the results obtained on the Baltimore & Ohio and Northern Pacific Railroads by oiling the center plates of cars, and thus, by reducing the friction at these parts, reducing the whole train resistance to such an extent that it was found practicable to increase the weight of trains per engine, as related by Mr. D. L. Barnes in his paper on "Recent Improvements in Freight Car Design."

As relevant to this should also be considered the growing practice of "machining" cast car wheels. While this is done to secure a more perfectly round wheel than is possible in the mold, another good object is accomplished: smoothing the tread of the wheel so that it will roll with less friction upon the rails, thereby reducing the resistance of the cars they run under to being pulled. Standing near the track it is easy to tell in the dark what cars in a train have new rough wheels, for they sound exactly as if they were running on sanded rails. Such cars pull when empty nearly as hard as ordinary loaded cars for the first thousand miles of service.

Rough wheels wear away the steel of rails much faster than smooth ones, decrease the weight practicable to be hauled per engine, and increase the coal consumption of locomotives sufficient to generate the power to overcome their rolling friction on the rails. A full recognition of the fact that friction in any form and wherever existing is always an absorber of power and the antagonist of moving force will lead in many ways to much further decreasing the resistance of trains.

JOURNAL BRASSES.

An abstract from a paper on "Bearing Metal Alloys," by Dr. C. B. Dudley, is given on another page. Many years of careful and intelligent experimentation have suggested the conclusions expressed in the paper, and are therefore entitled to careful consideration.

The best composition for journal brasses is a very important question for railroads, not only because of the economy to be effected by the use of an alloy that will give the greatest wear in service, but because of the importance of eliminating "hot boxes" from trains as far as possible, with their damage to journals and their annoying and expensive delays to trains. While friction is primarily dependent upon the quality and consistency of the lubricating oil, experience has shown that the composition of the bearing metal also has an influence, but not a variable influence, like the consistency of the oil.

Altogether the question of the composition of bearing metals is one about which there is much difference of opinion, many mechanical officers believing that the old seven of copper to one of tin composition, or cannon bronze, which for many years has been widely used, is hard to beat for all around service. Many others will agree with Dr. Dudley that this is a mistake, and that while it may not yet be known just what alloy will give the best results, several are known that will wear longer with less tendency toward running hot.

The conclusions arrived at in the paper, which we have not space to give in full, are that aside from the variables of pressure, speed, temperature, etc., there are three other elements that affect the wearing quality of journal brasses; that metal which has the greatest power to suffer distortion without rupture will wear the best; this quality being obtained in satisfactory amount, an increase in tensile strength will enhance the wearing power; of two metals of same elongation and tensile strength, the one finer in granular structure will wear the best.

The first two propositions have been proven by experimental data, and while the third proposition is unsupported by experiment, it is yet an interesting suggestion. Conceiving wear to be a process of grinding off of minute particles of the body, if the particles torn off are in one case larger than another the wear will be more rapid, assuming that the granular structure represents the size of the particle ground or torn away.

In support of the suggestion it is cited that what is known as case-hardened iron wears better than either the wrought iron from which it is made or steel of approximately the same carbon, and that the case-hardened iron is always characterized by an extremely fine granular structure, as evidenced by the fracture.

AIR BRAKES.

On another page is given a full report of the results of tests conducted at Burlington by the C., B. & Q. Ry. to determine the relative efficiency of the Westinghouse and New York air brakes. Competitive tests have also been conducted on the Lehigh Valley road which had ordered brakes for 2,000 cars from the New York Air Brake Co., but, as in several respects the results were indecisive, the tests are to be repeated. Referring to the C., B. & Q. tests, they re-establish, if it was needed or desirable, the excellent reputation of the Westinghouse brake, and they indicate that with some necessary, and, it seems, possible improvements, the New York brake may become a successful competitor in the rapidly growing air brake business.

The New York Air Brake Company allowed themselves, unfortunately, to be hurried in their preparations for the test, and they attribute much of the trouble experienced during the tests to poor workmanship in the construction of the triple valves, which were furnished by the shop on only 24 hours' notice; and the trouble noticed in the graduating test, it is claimed, might have been caused by a slight leak in the train pipe. It is really unfortunate that there should have been any hurried work in the preparations for such an expensive and important series of tests; and while the excuse is plausible, there can be no reasonable difference of opinion between all concerned but that it rests with the New York Air Brake Company to satisfactorily demonstrate that any defect in their apparatus that makes it less efficient than the Westinghouse can be thoroughly eliminated.

The safety of trains has come to depend too much upon the prompt and efficient action of automatic quick-acting air brakes to allow the use of any type that is not equal to the highest attainable standard of efficiency in every respect. And this becomes all the more emphatic with the increasing demands for high speed, and the proposed legislation requiring all cars engaged in interstate traffic to be equipped with brakes under the easy control of the engineer. That the new brake companies which are struggling into existence may be successful in their efforts to make their brakes second to none in general efficiency, is the wish of many who believe that there is room for competition.

The wisdom of the Master Car Builders' Association in appointing a committee to formulate requirements for acceptable brakes is apparent in view of the probability of active competition in the brake business, for of course the effect of competition is to lower prices, and that leads to the production of an inferior article. With the proneness of some railroads to consider price before quality, it does not take a long look ahead to see that but for some authoritative standard requirements inferior brakes might soon be causing no end of trouble and disaster in the interchange of cars.

The matter rests at present in the hands of a very able committee, Messrs. Rhodes, Gibbs and Wall. The chairman has suggested that the Association erect at some central point a rack for the purpose of testing brakes and insist that every one putting a new brake upon the market must take 50 of his appliances to this rack and there test them to see if they would meet the requirements that may be prescribed for a first class brake. Such a plan, if adopted and properly carried out, would be very effective in preventing the introduction of imperfect brakes upon roads that have a due regard for the rules and standards of the M. C. B. Association.

The addition of an ordinary locomotive to the testing department of the Purdue University, mentioned in this paper, is interesting not only from the fact of it being a new departure in locomotive testing in this country, but because tests conducted under circumstances that will shield the engine from the varying and immeasurable influences that it must contend with in service on the road will be more definite and trustworthy than road tests that are affected by differences of temperature, wind resistance and condition of rails.

Numerous matters relating to locomotive economy about which differences of opinion prevail among well informed practical men can, it would seem, be satisfactorily settled by a few tests such as the Purdue laboratory will be able to carry out, that otherwise could not be settled except by a long and expensive series of road tests which in the end might have elements of uncertainty.

We anticipate that much information of interest and value to railroad men will result from tests properly conducted on this plan.

It is reported that a Missouri Pacific brakeman, "Joe Fenaja," was recently exposed in a severe storm three hours and a half flagging, and was nearly frozen to death. We gladly record his fidelity to duty. No praise is too great for such faithfulness, and no censure too severe for the carelessness of whoever it was that made the "bull" that subjected the man to such exposure.

We trust the report is more truthful than the one which caused an esteemed contemporary to make the following comment:

"When a brakeman fails to 'go back' to protect his train, and an accident results from his failure, we all hear of it, but we are not so apt to hear of the many cases in which they do go back in the face of difficulties of considerable magnitude. A brakeman whose name is given as M. S. Cole, went back from a C. H. & D. train, near Dayton, O., recently, during the intensely cold weather, and held his position on the track until so badly frozen that his life is despaired of, and at least he will lose both his feet. Such a man is a real hero."

Upon inquiry, we ascertained that the man, while flagging during the cold snap in January, did have two of his toes frostbitten. He was confined to his home three or four days, and was in no way permanently injured.

We know of no country in the world that is more in need of silver than the Argentine Republic, and now it is reported that a vast bed of silver has been discovered there in the bottom of the Bay of San Blas. The black metallic sand which covers the bottom of the bay is said to be full of silver pellets, and the Buenos Ayres *Standard* believes that the silver deposit in the bottom of the bay is greater than in the famous Bonanza mines of California. During the last three years the fortunes of the country have been so adverse, through the financial blunders of the Government and the extravagance of the people, that all the blessings of nature that may be vouchsafed it in the way of mines of coal and silver and abundant crops will be needed to relieve the prevailing distress in all affairs of life.

Literary Notes.

The Mechanical and Other Properties of Iron and Steel. By A. Vosman, Engineer, 203 pages, 12mo., cloth. Price, $2.50. E. & F. Spon & Co., 12 Cortlandt Street, New York.

The author has gathered together the widely scattered information on this important subject, and gives in brief outline the actual knowledge of the intimate connection that exists between the properties of steel and iron and their chemical composition.

The Ventilation of Buildings. By Alfred R. Wolfel, M. E. Second edition. Price, 25 cents. New York; 315 Potter Building.

In this pamphlet the subject of the proper ventilation of buildings is treated in a terse, popular way, and the general principles of ventilation made very clear.

Roll Turning for Sections in Steel and Iron. By Adam Spencer, 4to, cloth. Price $17.00. E. & F. N. Spon & Co., 12 Cortlandt St., New York.

The subject of roll-turning is treated from a purely practical point, and for practical men. The work contains working drawings for rails, sleepers, girders, bulbs, ties, angles, &c.

M. C. B. Association.

The Master Car Builders' Committee on Joint Inspection and Interpretation of Rules has sent out a long circular asking for opinions on various sections of Rules 3, 4, 6 and 8. There are 23 separate questions asked. As the subject which this committee has to deal with is one of great importance to every railroad company, the committee hopes that all who receive this circular will give it special attention and give as full replies as possible to the questions. If the space allowed is not sufficient, attach additional paper to the circular.

Those who wish copies of it should address the Chairman, Mr. A. M. Waitt, Assistant General M. C. B., L. S. & M. S. Ry., Cleveland, O.

The Philadelphia & Reading are changing the color of their passenger cars to the Pullman color, with gold lines and letters, but not the elaborate decorations that are on the Pullman parlor cars.

Mr. George Crocker, ex-Chairman of the Railroad Commission of Massachusetts, and a member of the Committee on Safety Appliances, before a committee of the U. S. Senate, Feb. 16, advocated the bill providing for the equipment of railroad cars with automatic car couplers. He was opposed to any legislation which would compel the adoption of any specific coupler or leave its designation to any committee, and he thought that railroad companies should determine what character of couplers should be selected. He presented to the committee a draft of a bill in which he had embraced his ideas in the matter.

Mr. Haines, President of the American Railroad Association, opposed any interference by Congress in the determination of the type of coupler to be used by railroads. Mr. Wilkinson, Grand Master of the Brotherhood of Trainmen, said the switchmen were in favor of prompt action, but believed no coupler had yet been invented which would give satisfaction. T. P. Sargent, of Indianapolis, representing the Locomotive Engineers' and Firemen's associations, thought a commission should be appointed, composed of railroad officials and their mechanical employes, to test and make a thorough investigation into the best device to be adopted and to report its result to Congress for action.

The Atchison, Topeka & Santa Fé have ordered 20 engines to be built by the Brooks Locomotive Works. These engines are to be of the A. T. & S. F. standard type of 10-wheel engines, 18 × 24 cylinders, to carry 180 pounds pressure. They are to be equipped with the American driver brake.

Personal.

Gen. R. N. Hood, President of the Knoxville & Augusta Railroad, died at Brunswick, Ga., Feb. 1st.

Superintendent A. E. Welby, of the Rio Grande Western, has been given the title of General Superintendent.

Mr. John Doyle has been appointed Master Car Builder of the Missouri, Kansas & Texas, at Denison, Tex.

Mr. Fred Winkles has been appointed Master Mechanic of the Louisville, New Albany & Chicago shops at Monon, Ind.

Mr. John Henry has been appointed Master Car Builder of the Louisville, New Albany & Chicago shops at Monon, Ind.

Frank R. Lawrence has been chosen President of the Wheeling & Lake Erie, in place of M. D. Woodford, resigned.

Mr. George J. Mather has been been chosen to succeed Mr. J. R. Petrie as Chief Joint Inspector at International Bridge.

Mr. G. M. Hughes, formerly General Superintendent, has been appointed General Manager of the Atlantic & Danville railway.

Mr. C. A. Carlisle has been appointed Assistant General Manager and Purchasing Agent of the Chicago & South Bend Railroad.

Mr. A. G. Blair, Traffic Manager of the Wheeling & Lake Erie, has been appointed General Manager, the former office being abolished.

Mr. A. P. Tanner has resigned the office of Superintendent of the lines of the Atchison, Topeka & Santa Fé east of the Missouri River.

Mr. Lucius Tuttle, General Manager of the New York, New Haven & Hartford, has been chosen to succeed the late Edward M. Reed as Vice-President.

Mr. J. W. James, formerly President and General Manager of the Chattanooga Southern railway, has been appointed General Superintendent of that road.

Mr. Robert Walker, formerly Master Car Builder of the Missouri, Kansas & Texas, has been given the title of Superintendent of the car department of that system.

Mr. Frank Bruce, formerly General Master Mechanic of the Chicago & Eastern Illinois, has been appointed Master Mechanic of the Great Northern at Barnesville, Minn.

Mr. J. R. Petrie, Chief Joint Inspector at International Bridge, has resigned to accept a similar position with the New York Central and Lake Shore roads at East Buffalo.

Mr. C. L. Aiken has been appointed Master Mechanic of the southern division of the Boston & Main to succeed Mr. Amos R. Barrett, appointed Superintendent of Motive Power.

Capt. Robert Anderson, whose last railroad service was with the Western & Atlantic in the capacity of General Superintendent, died last week at Atlanta, Ga., aged 55 years.

Mr. F. H. Stark, General Car Foreman of the Wheeling & Lake Erie, has been appointed Master Car Builder of the same road, with full charge of all matters pertaining to car repairs.

Mr. Amos R. Barrett, Master Mechanic of the Southern Division of the Boston & Maine, has been appointed Superintendent of Motive Power of that road, to succeed Mr. William Smith.

General Superintendent D. H. Nichols, of the New York & New England, has resigned, It is stated that he will return to the West, in which section of the country he was formerly employed.

Mr. Frank M. Wilder, formerly Superintendent of Motive Power of the New York, Lake Erie & Western, is now Foreman in the shops of the Delaware, Lackawanna & Western at Buffalo.

Mr. J. W. Wilkinson has resigned as Purchasing Agent of the Oregon Improvement Company, and hereafter the duties of the office will be performed by Mr. H. J. Green, General Freight and Passenger Agent.

Mr. E. W. Bancroft, known among railroad men as George Bancroft, for many years General Foreman of the shops of the Columbus & Hocking Valley at Columbus, O., died in that city recently, aged 56 years.

Mr. F. P. Boatman, formerly Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis has been appointed Master Mechanic of the shops of the Queen & Crescent System, at Ludlow, Ky.

Mr. M. B. Cutter, General Superintendent of the Western Division of the Newport News and Mississippi Valley Rail road, has been appointed General Superintendent of the Louisville, New Orleans & Texas Railway.

Mr. G. D. Berry has been appointed Purchasing Agent of the St. Joseph & Grand Island and Kansas City & Omaha roads. In addition to his duties as Purchasing Agent he will act as the General Manager's Secretary.

Mr. John W. Sanborn, Superintendent of the Northern Division of the Boston & Maine, has been elected Acting General Manager of that road pending the appointment of a permanent successor to the late Mr. J. S. Furber.

Mr. J. F. Tucker, formerly Assistant to the President of the Chicago, Milwaukee & St. Paul, has been elected Vice-President and General Manager of the Chicago, Ft. Madison & Des Moines road, with headquarters in Chicago.

Maj. W. F. Shellman, who has just been appointed General Manager of the Columbus Southern, was formerly General Traffic Manager of the Central of George until last June, when the road was leased to the Georgia Pacific.

Mr. Edward J. Cuyler, formerly Superintendent of the Wisconsin division of the Chicago & Northwestern Railway, died in Chicago, Feb. 5. He had been in poor health for several years past, and was compelled to give up his position in June, 1890.

Mr. Alfred Walter, G eneral Superientendent of the Baltimore & Ohio Railroad, has left the service of the company to become General Manager or the New York, Lake Erie & Western Railroad. Mr. Walter is an experienced railroad man, having risen from the ranks.

Mr. I. D. Barton, who recently resigned the position of General Superintendent of the Long Island road, takes the same position with the New York & New England, succeeding Mr. D. H. Nichols, instead of succeeding General Manager Howard, as was reported last month.

Mr. C. Kadona, a young Japanese nobleman has become a member of the Corps of Pennsylvania Railroad Engineers at Phillipsburg, Penn. He is a graduate of the Government University at Tokio, and is in this country for the purpose of acquainting himself with the American way of operating railroads.

We have to announce the sad intelligence of the death of Mr. Edwin S. Riggs, who for 12 years has been the manager of the railroad department of the E. S. Greeley company, and a director and assistant treasurer of the same.

Mr. Riggs died Jan. 27, at his residence in 309 Lafayette Avenue, Brooklyn.

Mr. E. L. Moser, who has been in the mechanical department of the Philadelphia & Reading since 1883, and for the past year Chief Draftsman, has been appointed Mechanical Engineer to succeed Mr. Samuel F. Prince Jr., who recently resigned to take charge of the mechanical department of the Long Island Railroad.

President Chauncey M. Depew, of the New York Central & Hudson River, celebrated his "silver wedding" with that road on the evening of the 28th of January. The event was commemorated by a dinner at his home to the leading officials of the Vanderbilt lines and other large railroad systems. Mr. Depew's remarks were of a retrospective nature, and dealt with the growth of the Vanderbilt lines and gener al railroad progress during the 25 years of his active life in the service.

Mr. R. G. Gross succeeds Mr. M. L. Hinman as Vice-President of the Brooks Locomotive Works. Mr. Gross learned telegrapny at the age of 13, and was train dispatcher at 17 or 18 for the Grand Trunk Railroad of Canada. Later he was otherwise connected with the transportation service of that road, and after that with the Denver & Rio Grande and the New York, Lake Erie & Western. He entered the employ of the Brooks Locomotive Works in 1882, and soon after became the traveling agent of the works, which position he has continued to fill till now. Last summer he went to Europe in the interests of the World's Fair transportation department, and while abroad examined extensively the machinery used for transportation both in ancient and modern times.

Edward M. Reed, Vice-President of the New York, New Haven & Hartford Railroad, died Feb. 13 at his residence in New Haven, Conn., after a brief illness. He was born in Lancaster, Pa., Nov. 17, 1821. Mr. Reed was a self-made man. In January, 1843, he began his career as a railroad man by running an engine on the Baltimore & Ohio Railroad. In 1844 he took charge of the Philadelphia & Reading machine shops, at Port Richmond. He then became Superintendent of the Havana & Guines Railway in Cuba, where he remained until 1853. He was next Master of Machinery on the Hartford & New Haven Railroad, filling that position until 1872, when he was made Superintendent of the New York, New Haven & Hartford Railroad, succeeding to a Directorship and Vice-Presidency of the same road in March, 1874, holding those offices until his death.

General Manager James T. Furber, of the Boston & Maine, died Jan. 27 of pneumonia. Mr. Furber has been connected with the Boston & Maine for many years He was made General Superintendent of the system in 1873. He was one of the best known of New England railroad officials. From a biographical sketch appearing in the New York *Tribune* we take the following: "He managed the road as though it were his personal property. Any faction or element likely to prove inimical to its interests has been allowed no voice in the administration of its affairs. He ran the road for the accommodation and safety of the traveling public and the emolument of its stockholders. He never expended a dollar of the road's money until it had earned two. He was also an indefatigable worker. No man under him worked more hours than he; few worked so many. Mr. Furber was an important factor in bringing about the amalgamation of all the roads which now form the magnificent system under the control of the Boston & Maine corporation."

The Hon. M. L. Hinman has been elected President of the Brooks Locomotive Works, to succeed Mr. Edward Nichols, whose demise was recorded last month.

Soon after graduating in Buffalo in 1861, Mr. Hinman entered the employ of what is now the Brooks Locomotive Works, but then known as the shops of the New York & Erie Railroad, and which were under the charge of the late H. G. Brooks as Master Mechanic. He was from time to time advanced for faithful and valuable service, and in 1864 was appointed Division Clerk of the Northwestern division of the railroad, with office at Hornellsville. In April, 1865, he was appointed Chief Clerk of the Machinery Department of the road, with headquarters at New York, Mr. Brooks being Superintendent of the department. In October, 1869, he returned with Mr. Brooks to Dunkirk and was elected Secretary and Treasurer of the Brooks Locomotive Works, which were organized at that date, Mr. Brooks being the President. Upon the death of Mr. Brooks in May, 1887, he was elected Vice-President, the late Edward Nichols being the President. He has always been closely identified with the constant growth and prosperity of the works, which owe much of their success among the leading locomotive works of the country to his energy and conservative financiering.

The Otis Elevating Railway up South Mountain in the Catskills is now being built. The right of way has been secured and the contracts given out. The grading is in progress, and the completion of the road ready for operation is promised for July 1.

It is officially announced that the Canadian Pcific will soon be made a double-track line between Winnipeg and Fort William, on Lake Superior. This improvement has become a necessity, owing to the enormous increase in the grain-carrying trade from the Canadian Northwest.

The Annual Meeting of Indian Locomotive and Carriage Superintendents was held at Ajmere, in December last, but the proceedings have not been made public yet. One of the most important snbjects discussed was the best method of increasing the carrying capacity of goods wagons, without increasing the weight of the vehicles to any appreciable extent. Efforts are being made to introduce a uniform system, but some years must elapse before this can be completed.—*Railway Engineeer.*

The 12-inch rifle for the "Monterey," weighing 100,800 pounds, recently sent from the Washington Navy Yard to San Francisco, was carried on a special car fitted up for it by the Pennsylvania Railroad. The side sills of the car are plate girders 39 feet long over all and similar to those used in special cars for transporting wire cables. Equalizing levers distribute the load on each end to two four-wheel trucks of ordinary diamond pattern. The plate girders are 7 feet 9 inches apart, out to out. Their depth at the center is 23 inches, and at this point the clear height above the rail is 2 feet 7 inches.

The wheel base of each set of double trucks is 13 feet 3 inches, each truck having a 5-foot wheel base and the axle centers of the adjacent wheels of the two trucks being 3 feet 3 inches apart. The total wheel base of the car is 35 feet. The wheels are 33 inches diameter. The total weight of the car is 54,800 pounds.

The gun measured 36 feet 9 inches long, and its diameter 45 inches. The projectile weighs 850 pounds, and its charge of powder 425 pounds, which is capable of imparting a muzzle energy to the projectile equivalent to a train weighing 310 tons running 50 miles per hour. Evidently a hard hitter.

A curious combination of accidents occurred on the Pittsburgh, Ft. Wayne & Chicago road on the night of Feb. 11. About midnight two freight trains ran together near Lawrence Station, 117 miles west of Pittsburgh. Both engines were completely wrecked and thirty-five cars piled about them, effectually blocking the main line, which is a single track at that point. Wrecking trains were sent from Orrville and Massillon to clear away the débris, and orders were given to the limited and day expresses to stop at Orrville and take the Cleveland, Akron and Columbus road to Massillon. The limited, arriving at Orrville, started over the directed route and was just getting under good headway when the first engine suddenly jumped the track. The next engine followed and both bumped over the ties for several hundred feet. Half an hour later the day express reached Orrville and started after the limited. It also had two engines. The train was running at a good speed when it came in sight of the wrecked limited express. The engineers began to slow up, when the head engine gave a sudden lurch and left the rails. The second engine followed it with the baggage car, but the train came to a standstill in time to save the coaches and sleepers. No one was hurt. About 1 o'clock the same morning there was quite a serious freight wreck at a point between Verner Station and Woods Run, near Pittsburgh. Several cars were smashed up and two brakemen hurt.

Recent Progress in Car Construction and Design.

(*Continued from page* 39.)

to a wooden sill is more than 150,000 pounds, while the old type has less than 80,000. The increase in strength is nearly 100 per cent., and a natural inference would be that by the use of such devices the decrease in the cost of repairs would be, under the same conditions, about 50 per cent.

But, although the modern draft rigging is much stronger than the older form, the repairs are not less than they formerly were, and this is because of the increase of the shocks of service due to use of heavier locomotives and heavier cars. The modern draft rigging is as strong as it ever need be made for a wooden sill. When a rupture occurs now it is the sill that cracks and splinters, and not the draft rigging that breaks.

Formerly the draft sills were strong enough when secured to the longitudinal sill only by vertical bolts. Keys between the two were later substituted to assist the bolts. When the strains became too heavy for both the keys and bolts, then the sills were extended back to the transoms. Soon this was insufficient, and the transoms were displaced by the blows that the cars received, and a sub-sill, now commonly used, was introduced between the transoms to prevent their displacement, thus making what is, in fact, nothing more than a double center sill throughout the car from end to end, one sill lying under the other.

Another defect was found in the old form resulting from the location of the center line of draft below the sill. The blow taken by the drawbar being below the sill tended to double the cars up by bulging up the center, particularly in the case of flats. The use of a sub-sill, before referred to, prevents this. The equivalent of this is found in the latest form of the C., B. & Q. 60,000-pound cars, which is now the standard of that road. This design is shown in Figs. 2 and 10, which illustrates how the drawbar is passed through the end sill and is located so that the line of draft and shock lies above the bottom of the sills, and in such position as to give the cars a maximum resistance to shock.

With regard to the resistance of the draft rigging to shocks, something must be said about the additional provision for resisting heavy blows that is now made. Formerly the draft rigging itself received the entire shock. Two loaded cars moving together with a speed of one and a half miles per hour will close up the draft springs on both cars, and all blows greater than this must be resisted by the draft rigging itself unless some further provision is made. It has now become general practice to cast a flange on the top side of couplers which strikes against a wooden block bolted to the end sills whenever the shocks are sufficient to close the draft spring. Probably this flange comes against the end sill nine times out of ten when cars are coupled together. It is this flange which must in the future, as it does now, receive and care for almost the entire shock incident to coupling cars. Without it the best draft rigging that can be made and attached to wooden sills cannot be made to stand. Hence we may conclude that the draft gear should be made to withstand the pulling strains and the flange on the drawhead to resist the buffing blows.

It follows as a matter of course that the drawbar stop or flange should come against the end sill before the draft springs are closed up; but this important feature has been overlooked, and, unfortunately, the full advantages of the flange on the drawhead as a protection to the draft rigging have not been realized. The springs close up solid on new cars when the flange is against the end sills, with the result that when the end sills are driven in slightly by the flange on the drawhead, the draw gear takes a large proportion of the buffing blows. It is logical, then, to reason that the distance between the flange on the draw and end sill when the draft spring is uncompressed should be about three-fourths of an inch less than the movement of the spring. This would allow an indentation of end sills as much as three-fourths of an inch before the draft rigging would receive any severe shocks.

Some unscrupulous car builders allow the flange of the drawhead to come against the wooden stops without the interposition of any protection plate, such as is shown in Fig. 10. We have all seen these cars after a little service. The wooden stop is pounded away from one to two inches deep, and on such cars the draft rigging will always be found to be out of order and driven back out of proper position. It is needless to add that a draft rigging cannot be made to stand under such conditions.

Some attempts have been made to reduce the effect of shocks by increasing the capacity of the draft springs, and the absorption of the shocks by friction and compressed air buffers. This step, while good for other reasons, is wholly inadequate to serve the purpose intended. It gives in general better results in pulling trains by reason of the increased spring slack, but has no advantage to resist the heavy shocks. It is impossible to use a spring with a capacity that will make it equivalent in absorbing shocks to the wooden sills when struck by the flange on the drawhead. Again such a heavy spring as would be required to be of material value in absorbing shocks would have a recoil after being struck which would be disastrous not only to the cars themselves, but to their contents. A wooden buffer has practically no recoil.

The trussing and bracing of freight cars have received more attention in the past few years than for a long period preceding. Formerly the truss under the cars did not amount to much. It consisted mostly of a light truss rod having little camber and insecurely attached to the end sills, the end attachment being a small washer and nut on the outside of the end sills, with the result that when the car was loaded the washer would sink into the wood and decrease the carrying capacity of the truss rod. In any truss of this sort the less the camber of the truss rod the greater will be the pressure on the washers on the end sills for an equal load. With the old form of truss, with little camber, and hence heavy pressure on the wood in proportion to the load, there was used a small washer. A 2½-inch washer under the end of the rod and a 10-inch camber represent the old practice. Now a 4-inch washer on a large iron plate, as shown in Fig. 10, and a 27-inch camber to the rod is considered good practice. The diameter of the rod has been increased from ¾ to 1¼ inches with enlarged ends where the screw threads are cut.

There is still much dispute about the bracing of cars, particularly of the box type. Some believe that the whole load should be carried by the side framing of the superstructure, with perhaps some assistance from the truss rods, while others, and, I must say, the more progressive thinkers, believe that the framing of the superstructure should be used only to brace that structure, and not to carry the load; and, further, that the truss rod, its camber and attachments, should be arranged to carry the entire load of the car. This appears more reasonable from the calculations made to show the carrying capacity and deflection of the bracing in the superstructure and of the truss below. For a given load the truss without the superstructure will deflect, say, 2 inches, while the superstructure bracing is so rigid and stiff, by reason of its great depth, that when made sufficiently strong to carry the load it will deflect less than ¼ of an inch. As the resistance of any truss varies directly as the deflection, it will be seen that when the two forms of trusses, namely, the truss rod and the bracing of the superstructure, are combined together the tendency is for the superstructure to carry the majority of the load. It is evident that the two will not work in harmony, and owing to the difficulty of keeping up the bracing in the superstructure and of the desirability of having uniformity in construction of under frames for flats and box cars, it is better for these and other reasons to depend upon the truss rod to carry the entire load, and upon the superstructure bracing to keep the upper part of the car in good condition.

A very desirable improvement in the details of bracing of superstructures is malleable iron post plates, now used by the best builders to prevent the braces and posts of the superstructure from pounding and working into the side sills. It is common in stock cars, in which the bracing is exposed to view, to see the inclined braces and the posts sunk into the side sills from ¼ to ⅛ inch, with a corresponding slackness in all of the tie rods and braces of the superstructure. The use of this plate is a necessity if it is intended that the upper structure of the car shall carry any large proportion of the load.

A decided improvement in the latest car is found in the construction of the end posts. Formerly the posts were small and filled in the space between the lining and the sheathing of the car. They then had but little resistance to shifting loads. The new construction has a post 7 inches thick instead of 3½, and has a metal shoe on the end sill. The result of this new construction has been a decided decrease of bulged ends.

Drawbars have been changed materially. The new weighs but little more than the old and is vastly stronger, and, besides, is automatic. The improvement is evident to all.

There is no detail of car construction which differs so much in design as the center plate. Formerly the theory was that a center plate should have a ball bearing which would enable the truck to adjust itself to the track without moving the car body. The error of this has been shown by experience, and now the prevailing practice is to make a large flat bearing. With a spherical bearing the cars roll too much, and on a straight and level track one can generally tell, on a train running at speed, which cars have spherical center plates. With the spherical plate the car is generally resting on one side bearing or the other, and almost never in a horizontal position. Particularly is this true if the car is not uniformly loaded. The heavier side will always be down on the side bearing. With a flat center plate the car generally keeps a level position except on curves. One objection offered to a large center plate is that there is an increase in the friction caused by the turning of the trucks on curves; but while this may be true when only the center plates are considered, yet the side bearings have more to do with the resistance to the turning of the trucks than the center plates. With a center plate of small diameter the cars roll as much as with a spherical bearing and are just as liable to be down on one side, and in this condition there is a greater resistance to the turning of the truck due to the friction of the side bearing than could possibly exist with a center plate of reasonable diameter.

The result of center plate friction or resistance to turning of the trucks is found in the increased flange wear of the wheels and in the increased resistance of the train. Probably more attention is devoted to this matter on the Baltimore & Ohio road than any other. They use a large flat center plate which keeps the cars from tilting over until they bear on the side bearing, and all center plate bearings are greased by means of a long squirt oil can with which the plates can be reached from the outside of the car. The result is to reduce greatly the flange friction and the resistance of the train. It has been estimated that on a road having many curves the use of a proper center plate well oiled, will increase the average train load for the same locomotive about one car in 30. This estimate corresponds with the experience of the Northern Pacific on some crooked, narrow gauge lines where the center plates were oiled to increase the loads hauled by the engines.

In trucks the improvements have been perhaps greater than in any other part of a freight car. The side framing has not been materially changed except in dimensions, but the bolsters, spring planks and transoms have been greatly improved. To illustrate the change, I have selected details of two rigid trucks; one of the old and one of the new. Fig. 19 shows the old type with a wooden spring plank and bolsters, the inadequacy of which for modern service is evident. The new bolsters are yet partially built of wood, but they are now composite, with iron or steel plates between the wooden slabs, as shown in Fig. 20. The plates carry the load, and the wood acts as filling pieces in a very satisfactory way. It has been difficult to see how a purely metal bolster can be made to equal the composite bolster here shown. In the new design the wooden transom and spring planks are gone. Rolled steel channels securely riveted to malleable or cast iron end pieces are now used as shown in Fig. 21. In this way the trucks are maintained more nearly square than in the old form, and there is much less strain and wear on the vertical bolts, which secure the transoms to the side frames.

One of the most admirable features of this design is shown at Fig. 20, which dispenses entirely with the spring plank. It consists simply of a wide U shaped strap adapted to receive the spring plate at the bottom and with a lip at the top over the channels to carry the load. This may be taken as the best form of modern freight car truck now generally used, and is certainly a marked improvement over the old form.

The most radical proposed change and improvement in trucks, and one which is not yet generally used in this country, but is commonly used in Mexico and foreign countries, is the pressed steel truck. There are now in use here about two hundred on about forty different railroads. Undoubtedly you are all familiar with the general construction. It has springs over the axle boxes, and is made up of four main parts; two side frames and two transoms. It weighs 3,000 pounds per car less than the average truck now used, and has the advantage of being made of the highest grade of mild steel. So far as used there have been no defects made apparent. Its future in this country is, of course, problematical, but its simplicity, cheapness and durability, are such as to gain for it a fair trial; and if the results are anywhere near equal to those obtained in Mexico under similar conditions, we may expect that either the form now being tried here, or some other form of pressed sheet steel truck, having few parts well riveted together with large rivets by hydraulic pressure, will become the truck of the future.

One of the most marked changes in truck construction is that from rigid to swing motion, and the return to rigid trucks for freight service. The swing motion truck was introduced after the period with which these comparisons are made. It was put in at first to make the cars ride more evenly and perhaps more steadily. This did result at low speeds. The swing motion was formerly about one and a half inches each way from the centre. As speeds increased and live stock was carried, it was found that the lateral motion was too much, and the cars at speed took on an oscillating motion which made them very unsteady and threw the stock down. Gradually the lateral motion was reduced until it reached about one-half inch each way from the center. It was found that as the lateral motion was decreased the cars became steadier, and it was not uncommon to block the swing motion on stock cars to make them ride better. The cost of maintenance of the swing motion part of the truck was greater than the cost of maintenance of other parts of the framing. Hence, the natural result, the swing motion was discarded by those roads which kept a close watch on the cost of repairs.

The improvement in car wheels is decidedly satisfactory. The Barr contracting chill has led the procession of improvement with the result that all wheel makers are now making better cast wheels in both plain and subdivided chills than ever before, and those who dispute the efficacy of a contracting chill will have to admit that it has forced them to use better material and more care in the manufacture than formerly. There are a few left among the manufacturers of car wheels who still dispute the advantage of such a chill; but there is an overwhelming majority that pronounce in its favor, and the records of mileage of modern chilled wheels are from 25 to 50 per cent. superior to the records before the modern process of manufacture was introduced. It is curious to note at this point that the United States is the only country that is doing a really heavy freight business under conditions which give a severe test to car wheels, and it is also the only country where cast iron is used to any considerable extent for car wheels. Mechanics in other countries are afraid of this class of wheel, but such fear is not warranted by experience in this country. Necessity here has compelled the use of cast wheels almost from the beginning, and all of the many developments in the manufacture of metals have failed to produce a material more suitable for cast car wheels than the grade of cast iron now used here in the best class of chilled wheels.

All know the old form of brakebeam. Too many of them are now running on new freight cars. It consists of one piece of green timber with a clumsy cast iron head on each end and a cast iron lever support at the center of the beam, which is attached by bolts which cut away the material of the beam at the weakest point. The construction is the worst possible, and it is only in this country that such beams have been used to any extent.

The modern brakebeam is probably the best we will get for some years to come. It is formed of a compression member with the material disposed in such a way as to give the greatest stiffness for the least weight, and a tension member of any form which has sufficient area of section to give the desired tensile strength. The heads are made of malleable iron or cast steel, of excellent design, and weighing less than one-third of the clumsy head used on the wooden beams. When the modern beam is made an initial tension is put on the tension member for the purpose of bringing all parts to a firm bearing before the beam is strained in service. In this way the deflection of the beam when the brakes are applied is made less than it would be if the parts were loosely put together.

The extremes in design of beams, the poorest and best, are now used by our car builders and shipped on new cars on the same day. It is a curious sight to see this variation in such an important detail. One road running through a given territory and doing a given class of work uses the poorest possible form of brakebeam while another under the same conditions uses the best. Nothing but a short-sighted policy can explain the further use of the wooden brakebeam. It is short-sighted on the score of economy alone, and unwise in view of the possible government legislation compelling the use of airbrakes for freight service. The use of a wooden brakebeam with an airbrake is impossible, as any one will find who tries it. The adjustment of the shoes controls the situation, and there is not travel enough in our present airbrake cylinders, when used on 50,000 or 60,000 pound freight cars, to permit any such deflection of the brakebeam, as is had with the wooden beam. One fourth inch deflection, which is small for a wooden beam, corresponds to 1⅝ inches travel in a cylinder, an amount much too large to be permissible. The one-sixteenth of an inch limit fixed by the M. C. B. Association as being all that is practicable to allow, is too small to be easily attained with an iron or steel beam, and beams purchased in the open market will be found to vary as much as 50 per cent. above this limit, even when intended to meet the standard requirements. The differences in the manufacture of the different beams is enough to account for this, and the utmost care is needed to obtain beams as stiff as must be used to gain all the advantages of the airbrake.

Car brakes, so diversified in type some years ago, have simmered down to practically one kind; namely, a continuous, quick-acting automatic compressed airbrake. It is continuous because it is applied on all cars supplied with the apparatus whenever it is applied to one; automatic, because it will operate whenever the cars are separated by the breaking of the train, and quick acting, as it applies on the rear of the train so quickly after it is applied at the front that the rear cars are stopped before they can run into those ahead of them.

The continuous brake is necessary to control trains with any certainty. The automatic brake is essential to prevent serious wrecks when trains break in two. The quick acting brake is compulsory, and by it alone can disastrous shocks be prevented when a sudden stop is to be made.

Considerable increased interest in freight train brakes has been aroused within the last year for three reasons. There is a strong probability that our National government will compel the use of power brakes on freight trains to decrease the injuries to trainmen and increase the safety of passenger trains running on the same or on parallel tracks. Again, the results of the records kept by roads that have used freight train brakes show conclusively that the reduction in the number of wrecks, the increased rapidity with which trains can be handled, and the increase in speed of freight trains, quickly pays for the entire first cost of the power brake and its maintenance. Also, there is a prospect of competition in the air brake market.

Cars for coal and ore service have been but little improved when compared to what is necessary to make them really serviceable. The hopper form will ever remain the favorite with those who seek to reduce the cost of transportation. Now while there has been some little improvement in the smaller details of these cars, there has not been much change that may be called an improvement in the hopper portion, unless it be in the lining of the hopper and all the interior with heavy sheet metal. What is needed for this class of work is a good all-metal car. The success of all-metal hopper cars on the Baltimore & Ohio is beyond criticism, and should form a basis of design for those who are contemplating the construction of hopper cars.

One of the most radical changes in material for the details of freight cars is that from cast iron to pressed steel, with the alternative of malleable iron. The last two materials are fighting for a supremacy; and as each has its own advantages and is better adapted than the other for some details, we may expect that both of these materials and cast steel will find a place in the car of the future and entirely supersede cast iron. The introduction of pressed steel has forced the malleable iron makers to produce better stock, and a decided improvement of design and material in malleable iron parts is apparent. Pressed steel has the advantage of being tough, durable and practically unbreakable, while malleable iron can be made in forms and shapes that are desirable, and into which steel cannot be pressed.

One improvement in the very recent car design is the completion of the lining of the car to the top plate. By doing this not only is the car strengthened, but it is made more durable, and perishable and moist freight is kept away from the space between the lining and sheathing.

In looking over the progress of car construction in the past few years, one cannot fail to notice the changes and improvements in the specifications prepared for the builders by the railroad companies and the new methods of inspection. The subject is too broad for consideration here. I can only state that a proper specification results directly in a better car for less money. A recent large order for high grade 60,000-pound cars was let for 10 per cent. less price per car as a result of a complete revision and a decided improvement in the specification. The revision consisted in reducing the requirements for material in certain unimportant parts, and increasing those for the fundamental details that are deteriorated by use.

Large meetings of railroad brotherhoods were held in New York City and in Indianapolis early in February. That in New York City was under the auspices of the Order of Railway Conductors, and is claimed to have been attended by 2,000 delegates. Prominent members of the Firemen's, Trainmen's and Telegraphers' brotherhoods were present. The reports indicate that proposed legislation in New York State was the chief subject under discussion.

Communications.

Feed Water Purification.

Editor National Car and Locomotive Builder:

I have been much interested in the controversy through the medium of railroad periodicals on the subject of purification of feed waters, and have been hopeful of learning something new and valuable on the spbject, but so far have been in a measure disappointed.

I have had no little experience in efforts to secure satisfactory results in purifying feed water for stationary and locomotive boilers, and while the experiments may not have been on such scientific principles as others bring into use, the results have been after the manner of those giving their experience at the present time.

The matter of chemicals, fluids and so-called compounds have received attention and every possible advantage given to bring success, but not in one instance in locomotive boilers did they prove of any value whatever, but rather a harm in many of the trials.

I note the reports from those who seemingly bring success with the use of compounds, and as I read between the lines it appears quite plain that the good results obtained from use of these combinations of ingredients does not lie in the fact that there is any great merit in the mixture, but that the employé or employés are arbitrarily required to keep the boilers which are supplied with the compound thoroughly and absolutely clear, which (with no regard for the expense) can be accomplished in any class of water without the use of mechanical devices or compounds of any nature.

This may appear to be a very broad and strained assertion, but is nevertheless true.

The object in using mechanical devices or compounds is to decrease this expense and secure the use of the boiler a greater period between the resetting of flues and other necessary repairs.

I am an advocate of mechanical devices, and while it appears that none has yet been produced with capacity sufficient to take from and care for the solid matters contained in foul waters on account of the vast volume necessarily used per hour, yet it has been demonstrated that longer continued service can be secured from boilers with proper mechanical devices in use, the life of the boiler greatly lengthened, and if a standard boiler filler and washer be used in connection therewith, and manipulated judiciously without any arbitrary requirements, boilers can be kept fairly clean and with less expense than by any other known method.

This is my experience; and I am confident there are now mechanical devices in use which need not be removed for cause until the natural life of the material be run, which should be at least ten years, and the cost for renewing be but a very light expense.

Prejudice in the motive power ranks can be charged with barring out many useful devices in the past, and no doubt will so continue, but the mechanical superintendent who takes advantage of valuable improvements, in so far as his management will permit, need never be ashamed of the figures representing the cost for operating locomotives which are presented for the information of the officials and stockholders.

The day will come, unless there be radical charges in locomotive construction, when a mechanical device will be used on every locomotive engine, is my firm belief, not only where it is necessary to find some relief from impure waters, but also in localities where comparatively pure water abounds, and there it should be used as a heater and circulator, for therein lies more value than is universally recognized by the mechanical men of this day.

M. M.

Car Ventilation.

Editor National Car and Locomotive Builder:

Replying to your editorial remarks regarding car ventilation, in the February number, wherein you state, "It must be acknowledged that but little progress has been made in ventilating passenger cars since the present type of car was adopted," we think you will agree with us, that until a car is made to breathe or to take in fresh air and expel foul air in uniform quantities, the result cannot be accomplished.

The reason the air in a passenger car becomes so quickly impure is that in a car without passengers its normal condition contains over twice as much poisonous gas as in the outside air. Should a car contain one passenger the air would be sufficient to last less than three hours. If the car had fifty passengers the air would become contaminated in less than four minutes. Therefore it would seem that the problem to be considered is the entire change of the air within the car at least once in four minutes, or, in other words, "to reduce the proportion of carbonic acid in the air as much as possible without causing any considerable change in the temperature."

Up to the present time the accepted idea for ventilating a car has been to provide swinging sashes in the car deck to permit the heated and foul air to escape; trusting to the cars receiving its fresh air supply by the various leaks and the opening of windows or doors. More attention has been given to devising means to operate these swinging sashes in unison than anything else. That this plan does not work satisfactorily is obvious, and the reasons likewise.

A ventilator is being manufactured that will meet every one of the foregoing requirements; automatically keeping up a circulation in the car under all circumstances; positively excluding all dust, dirt, cinders or gases, and at a speed of 10 miles per hour will entirely change the air in the car every three minutes without producing any draughts or perceptibly changing the temperature in winter time. In summer there will be no necessity for opening either doors or windows, as the air will always be fresh and pleasant. The cost of attachment is nominal to any passenger car, as there is no change in construction of the car necessary.

Four cars so equipped are in daily operation on the Old Colony Railroad, and six on the Pacific Short Line.

Very truly yours,
PERRY VENTILATOR COMPANY,

Resistance of Trains.

Editor National Car and Locomotive Builder:

I have read your editorial on "Winter Resistance of Trains" in the February paper. I think you are on the right track for winter resistance. There are a good many things that contribute, to my mind, aside from lubricants, which, no doubt, ought to be looked after more closely, and I have frequently called our people's attention to this. In winter our men are more negligent in regard to the care of cars than they are in the summer, when the sun shines and when it is more pleasant to be out. The fireman is not so apt to get down and clean out the ash pan of the locomotive as frequently, to allow free combustion, in the winter as he does in the summer, and I think there is a great deal of unnecessary condensation, especially in the cylinders, because of their not being properly protected from the cold winds and snow, and the amount of radiation from the cylinder, which is the vital part of the engine, must be immense on a fast train with the thermometer below zero.

The fact that trains, after being warmed up, pull very much easier than they do when first started, shows your theory in regard to the viscosity of the oil, to be correct. It is a well known fact that a freight train, after having been pulled a number of miles and then allowed to stand a very few minutes, starts very hard, and if some lubricant could be provided that would retain its fluid state in cold weather it would help matters a great deal.

The dragging of brake shoes at all times is serious and will be more so as we equip with air. GEN'L SUP'T.

[The above communication is from the General Superintendent of a prominent road which experiences very fully the hardships resulting from the increased resistance of trains in winter.]

The Central Railway Club.

The annual meeting of the Central Railway Club was held Jan. 27 at Buffalo. Resolutions were adopted extending to the bereaved family of the late W. F. Turreff the sympathy of the club. The report of James Macbeth, Secretary and Treasurer, stated that the past year for the club has been one of activity, and the aim had been to endeavor to keep abreast of the times in all matters pertaining to the welfare of the club. The present membership is 138, a gain of 20 over 1890. The members of the club are active and energetic and take more than ordinary interest in the welfare of the club. It has been the aim of the secretary to gain the acquaintance of other prominent clubs throughout the country, with a view of having closer connections and thereby reaping the benefits of each other.

WHEEL GAUGES AND DEFECTS.

This subject was laid over at the last meeting for discussion. In reply to a question from the president, Mr. Griffin, of the New York Car Wheel Works, said, in view of the fact that in recent years the flanges of chilled wheels have been made thicker, he believed the proposed new gauge could be used with safety. This gauge will allow wheels to run with sharp flanges that are not worn vertical, or to such an extent as to make them unsafe, while at the same time the gauge enables each inspector on its application to determine whether it should be condemned.

Mr. Mackenzie moved that the gauge recommended be sent to the Arbitration Committee of the Master Car Builders' Association for adoption, with the approval of the club. Carried.

Mr. P. H. Griffin read a paper on car wheels and brake service in connection therewith, from which the following is an abstract:

When the strains imposed on a car wheel are considered it can readily be seen that great danger may arise from improper condition of manufacture or use. Brake service is perhaps the greatest hardship to which wheels are subjected. It is productive of two extreme results. First, brake sliding; second, heating wheels from continued application on grades.

The first result simply unfits the wheel for service; it involves no particular danger to the wheel; only the expense of the replacement. The second develops heat in the wheel arising from frictional contact to the extent that the application continues, and in proportion to its severity, and may lead to more dangerous results.

The face of the shoe should conform exactly to the curve of tread of wheel; it should be "machined" so as to give perfect contact when first used. It is common practice to take brakeshoes as they come from the foundry, many of them made with the joint of mold running lengthwise to face of shoe in the center, consequently producing a ridge or elevation the whole length of the shoe that must be worn down in service. The taper of patterns from which such shoes are made contributes to increase this elevation and the rapping of pattern in mold to enable "good drawing" also increases it. Almost any brakeshoe made this way will show a projection of one eighth of an inch in center, tapering off to the sides. It is possible in most cases to alter pattern so that the entire face of shoe will be on bottom of mold and a better surface result. Sometimes patterns are used that are old, out of shape, or that may not have been made to a proper radius to begin with. A careful examination for these points should be made from time to time.

Again, shoes are made that bear on the outer part of tread and point of flange, the center being cut out so that there is no contact with the part of the wheel that runs on the rail. The heating of flange from this cause is very dangerous. On the opposite side the drip from oil boxes keeps the outer edge of tread in such shape that proper friction cannot be obtained. The area of face of shoe should be as great as practicable, because the greater the area of contact the better the frictional contact. Almost any brakeshoe used in passenger service can be made with larger surface, in some cases to the extent of 33 per cent.

There are very serious objections to the use of car wheels for brake service at all, but it is doubtful if other practical means can be found to do the work. It is a subject worthy of careful thought. The greatest objection is the damage sustained by the wheel from the heat developed by friction. A severe brake application of but a few moments will raise the temperature of the tire or tread so that the hand cannot be placed upon it. Trautwine's tables of expansion of metals give the expansion of steel at a raise of 180° at $\frac{1}{8}$ inch in $8\frac{3}{4}$ feet, and of cast iron $\frac{1}{8}$ inch in $9\frac{1}{2}$ feet. This means an expansion of nearly $\frac{1}{4}$ inch in the circumference of a tire of a 42-inch wheel under ordinary conditions, which are repeated innumerable times. The expansion in cross section of tire is much less, but it is never ending, and must be destructive to the metal. What happens when the rise in temperature runs to many times what we are talking about? The subjects of car wheels and brake service are indeed some of the most vital in connection with railroad service. If practical car wheel makers and practical railroad men can work upon them a little more in common, good results will certainly ensue.

The President announced the following subjects for the next meeting:

A uniform charge for labor for repairs made to cars.

Steel trucks for freight cars.

The following officers were elected for the ensuing year: President, Eugene Chamberlin; Vice-President, F. B. Griffith; Secretary and Treasurer, S. W. Spear; Assistant Secretaries, W. E. Corcoran and H. D. Vought.

After the meeting of the club the members and their invited guests, many of whom were accompanied by ladies, sat down to the annual dinner. The party numbered over 100, and the occasion proved a delightful finale to the record of the year.

The Western Railway Club.

At the January meeting resolutions were adopted extending the sympathy of the club to the family of the late W. F. Turreff.

The discussion of M. C. B. standards and defect cards was opened by Mr. A. M. Waitt, who said: "It is singular to find what a great amount of ignorance there exists with regard to what the standards are. In thinking the matter over there are two points that impressed themselves on my mind. One is that some action ought to be taken, either by the Master Car Builders' Association or others, to bring before the heads of mechanical departments of railroads *all* of the standards and to ascertain if they have adopted and are using those standards on their roads.

"I believe it behooves every head of a mechanical department on a railroad to take the standards up one by one and see if each one of the shops on his line is using them, and using them exactly. A standard is nothing unless it is lived up to in every detail, and it better not be adopted unless it can be carried out in detail; otherwise standards only add to the confusion. When standards are adopted in anything pertaining to size, there should be a standard standard, if I may use that expression. That is, there ought to be copies of the standard or gauges made by some reliable firm as the Master Mechanics have of their tire gauges made by Pratt & Whitney. It is essential in order to have dimensions correspond where they are used by different companies, that they be obtained from some house selected for the accuracy of its work, and then distributed. We have, as we all know, a Master Car Builders' brake shoe. There are a dozen roads over the country that cannot interchange them, though they suppose they are following the pattern. One railroad says to another: 'Let us have one of your shoes, so our pattern maker can make a pattern from it.' He makes it, and gets it 1-16th of an inch off in some vital point. Then a third railroad borrows this pattern from which to make one for themselves, and they get it a little further from the correct thing. I can point to one road in New England that has three distinct standards of Master Car Builders' journal bearing. That was done by getting patterns from another road and not making them alike, and thinking they could vary this point or that and improve it just a little bit.

"I think a number of standards ought to be adopted that are not at the present time. I think it would be a great advantage if we could unite on standards for timbers of cars, 60,000 capacity or 40,000 capacity; in some way get down to uniformity. We could have a standard size, which would go a great ways and it would bring uniformity in the cars and enable the car companies to carry seasoned lumber in stock, ready to build cars for any road, at short notice. If we order 250, 500, 1,000 cars on short time we have to take new lumber, and the results are that the cars shake to pieces and the lumber shrinks and does not last

more than two-thirds of the time it should. If we could have standards in that direction I believe we would gain a great deal."

Mr. Rhodes: I think with Mr. Waitt that the matter of standards is a very important one, but how to get the proper enthusiasm in the matter is another question. There is, however, a danger of having too many standards. I do not quite agree with the writer of the paper read at our November meeting about having a standard car. I think that would perhaps be going farther than is necessary or desirable. In the paper it was stated that certain of those who used and handled equipment wanted uniformity above all things; they did not care for anything else; they wanted uniformity. Well, that is what the Chinese have got; and if we have too much of it, we may get to their condition. I think that standards in certain details may be followed, but we must not stop progress by carrying them too far. Now, while Mr. Waitt was talking it was suggested to me that a standing committee could follow the method of procedure employed with our interchange rules; certain roads agree to conform to those rules, and we know who they are because they sign a statement and that is published. It seems to me the committee might do something in the way of publishing the results of its work. For instance, ascertain from the different railroads if they are using the Master Car Builders' standard axle as a standard on their new equipment; the same with brakeshoes, and so on. And they should go more into detail, and find out what methods the roads have of knowing whether their standard really conforms to the Master Car Builders standard. It seems to me that a committee taking the matter in that way and making an annual report, might bring about better results than we now have, but I believe that it will only be by publishing the records.

Mr. Forsyth: Mr. President, in regard to the standard car body, as proposed by you, I think one of the principal reasons why one has never been adopted is because lumber is so cheap and it is such an easy thing to shape into the particular form of that which is wanted in the car. You have stated the fact that parts of the truck have been made standards to a greater degree than the body. The reason of that is that iron is more difficult to shape into an odd size and it takes more time to do it than it does when wood is the material. Another reason is that when the large roads are increasing their equipment at the rate of four or five thousand cars a year, the individual standards of the roads themselves become more important to them than the standards of any association, and you will find that it becomes more and more impossible as the years go by and as the equipment of these roads increases, to obtain a standard car body. The roads will more and more be for maintaining their own standards.

In regard to inspection, Mr. Mackenzie said that there is nothing farther away than uniformity in inspection of freight cars, and that such uniformity should be the first thing to strive for.

The Northwest Railroad Club.

At the last meeting of this club papers on the subject of car roofs were presented by F. S. Woods, of C. B. Hutchins & Sons; M. A. Garratt, of F. W. Bird & Co (Neponset Roofing); James P. Elmer, of Drake & Weir, and J. B. Quigley, of the Freight Car Equipment Company (Cable Iron Car Roof), of St. Louis.

Mr. Woods said that up to the year 1886 there were 10 types of roofs in the market, viz.:

Metal.—The Winslow, the Chicago Corrugated, the Empire Corrugated, the National, the Anchor outside iron, the Plain black iron outside and tin.

Plastic.—The Winslow Asphalt (or Drake & Weir's), the Huchins composition.

To these can be added the double board roof known to all car builders and railroad men in general.

The conclusions from the reports of the M. C. B. committees were in general unfavorable to metal roofs, for various reasons that are stated in the report of 1887, and in 1888 the committee added to the conclusions of the former report that it is quite evident that the plastic type of roof is fast coming into favor. Since the report of this committee new roofs of so-called plastic types and many metal roofs have appeared and are seeking a market. Among them may be mentioned: Murphy outside iron, St. Louis; Excelsior outside iron, St. Louis; Cable outside iron, St. Louis; Link outside iron, St. Charles, Mo.; Neponset paper, East Walpole, Mass.; S. E. Barrett & Co., Chicago; John G. Tait, New York; Philip Carey Manufacturing Company, Cincinnati, O.; Lee Composite Manufacturing Company, New York; Silicon Textile, Chicago, and some others, till the list almost equals that of the car couplers.

Inasmuch as the plastic type of roof is passing through an experimental stage, it is too early to give a decided opinion as to its usefulness. The expense of inside metal roofs for metal sheets alone is stated as from $18 to $25 a car. Outside roofs for a 30-ft. car would cost $27.20 to $30.60 for the metal alone, and in both cases the labor item would be rather important, as somewhat skilled labor is required to put them on.

The oldest of the plastic roofs is the Hutchins, which has been on the market for 12 years, having been first applied on the Michigan Central, where it has been adopted as standard. Mr. Woods reports Mr. Miller, General Superintendent of the Michigan Central, as having said that, after a personal experience of every type of roof that had been brought out for 20 years, he considers the Hutchins the best and the cheapest ever used on a car. About eight or nine years ago it was brought into use on the Panhandle, and other railroads took it up, so that at present between 50 and 60 railroads have this roof in service on cars ranging from a small number in some cases to as many as 5,000 in others. This roof was at first used as repairs, but has gradually come into use for new equipment, until now the orders of the Hutchins Company average about 10,000 roofs a year. In the last six months of 1891 their orders were for over 8,000 roofs, 6,700 of which were for new equipment.

The composition which enters into the construction of the Hutchins roof is a distillation of pure pine tar which acts as a wood preservative, so that where roof boards come in contact with it they retain their soundness for years. Thus in the material itself and method of application the roof meets the requirements of the Master Car Builders' committee, referred to in the reports quoted, and is the only one in the market at the present which does do so.

Fuel Notes.

The outlook for the recently discovered coal mines in the Argentine Republic is so favorable that the railway companies of that country have declined to renew their contracts with the British mines for fuel. Hitherto all the coal burned on the Argentine railroads has been imported, but it is believed that the newly discovered mines will furnish a supply entirely sufficient for domestic consumption.

At Fagersta in Sweden briquettes are now being manufactured out of wood charcoal, by the addition of coal tar. A paste is made out of the charcoal and the tar, which is transferred to a press, whence it issues in slabs about 16 inches thick, which are exposed to the air on the ground for several weeks, during which period the water in the tar evaporates. This combustible has been successfully employed for steam boilers, its calorific power being said to approach that of the best English coals.

Movements are on foot in various quarters having for their object the abatement of the smoke and fog nuisance. The London fogs which descend upon the town are bad enough, but are made almost unbearable to the healthiest and most robust people by smoke. Some interesting facts were elicited at the interview granted recently by the Lord Mayor to a deputation from South Wales which wanted to introduce anthracite coal for house purposes. It was shown that the coal was largely used in Paris, Berlin and other continental and American cities which enjoy an atmosphere absolutely pure compared with London's. The deputation held that anything tending to abate the fog nuisance should be given a fair trial. Sir John Puleston, who introduced the deputation, said that there were 700,000 houses in London and 1,500,000 chimneys. On a cold day about 40,000 tons of coal were consumed, emitting 480 tons of sulphur. His argument was that anthracite coal was cleaner and cheaper if householders could only be made to understand it.

The production of coal in this country by census years has been as below, in gross tons:

	Anthracite.	Bituminous.	Total.
1850	2,999,017	3,406,206	6,405,223
1860	8,391,367	5,156,319	13,547,686
1870	13,985,960	15,348,585	29,334,545
1880	25,580,240	38,173,414	63,753,651
1890	40,665,152	84,370,533	125,035,685

The three great coal producing countries of the world are, in the order named, Great Britain, the United States and Germany. The production and the increase in each country is given below;

Coal production 1870 and 1890 (1 = 1,000).

	1870.	1890.	Increase.	Percentage.
Great Britain	109,035	181,614	72,579	66.56
United States	29,335	125,036	95,701	325.89
Germany	26,397	70,039	43,612	165.33
Total			211,922	128.62

Although England has relinquished to us the supremacy in pig iron production, she still leads us in the production of coal by over 56,000,000 tons. In this she now occupies the relative position held by her in 1885 and '86 in the production of pig iron. In 1890 her coal production was 59.3 per cent. of the total in the two countries, and in 1870 it was 78.8 per cent.

The area of our coal fields is estimated as 192,000 square miles, of which it is thought 120,000 square miles could be profitably worked at present if there was demand and transportation enough. West Virginia alone has more coal than Great Britain, though only 7,281,430 gross tons were dug there last year.—*Coal Trade Journal.*

A NEW KIND OF FUEL.—"Any you gentlemen know Garnie Shea?" queried Panhandle Dan. "No? Garnie went down to Texas about 'steen years ago to take an engine on the Waydown & Bangup. Have nigger brakemen and firemen down there altogether, you know. The nigger they put on with Garnie was a great, strapping, sassy buck that thought he knowed more'n the man that invented railroads. Used to tell Garnie how to work his engine, how much throttle and how much quadrant to give her, and so on. Well, naturally, seeing Garnie was a little high-spirited, they didn't get along first class; they quarreled like married folks and kept an eye on each other all the time for fear of getting slugged.

"One day they was bowlin' along over the prairie when a thunderstorm commenced gathering over 'em. Garnie and his nigger was each lollin' out of his winder watching the clouds when there came an awful clap of thunder and a bolt of lightning struck the engine, paralyzing them both for about two minutes. They both came to at the same time, and each thought the other belted him with the coal pick when he wasn't looking. 'Course it made 'em both awful mad to think they had been taken advantage of, so Garnie grabbed a soft hammer, the nigger took the monkey-wrench, and they went at it and they didn't stop until the nigger was too dead to fight any longer.

"Garnie wasn't used to livin' in the South and he felt worried about that nigger, so he just opened the door and chucked him into the firebox. Garnie went right along with his train thinking he'd call over a brakeman to fire her in as soon's he could fix up a story to account for that coon. But the old mill kept running along and seemed to keep hot, so he didn't do anything.

"Gentlemen, he was about 40 mile from the end of his run when this happened, and he took his train in without putting in another fire. That nigger made steam equal to half a tank of coal. Garnie was a curious sort of a chap, always trying some project or other, so he thought he'd experiment a little. So as soon as he got out of sight of town the next day he poked his new fireman into the firebox, and when he burned low he called over the head brakeman and chucked him in, and then after a while the hind brakeman. He found after thorough trials that three, good, fat niggers would take a full train over the division in fine shape, equal to three tanks of coal in fact, besides steaming steadier and being easier on the engine."

The excessive cost of fuel on the Pacific coast stirs consumers there to unusual efforts toward economy in its use, and the Southern Pacific company is especially fortunate in having the services of such an efficient superintendent of motive power as Mr. Henry J. Small, who appreciates the importance of the matter and entertains very advanced ideas relating to fuel economy. As nearly all the coal used in California is transported thither over long distances, much of it coming from Australia, an unusual amount of slack is formed in transit, and as coal in such condition is not fit for locomotive fuel, special treatment is necessary to make it so or it will be practically a dead loss. The treatment adopted on the Southern Pacific is to press the slack and dust into bricks, or briquettes, using asphaltum and maltha as cementing materials. Following are the results of a series of tests recently conducted to ascertain the value of the briquettes of Carbon Hill coal slack as compared with Carbon Hill coal in good condition. The percentage of value is reckoned by comparison with Cardiff coal as 100, the evaporation of water with one pound of Cardiff coal being 8.369 pounds.

RESULT OF FUEL TEST WITH 3-POUND BRIQUETTES, 12-POUND BRIQUETTES, AND CARBON HILL COAL—SOUTHERN PACIFIC CO.

	3-lb. B.	12-lb. B.	C.H. coal
Number trips	6	6	6
Miles per trip	86	86	86
Average gallons water per trip	3,491	3,988	3,814
Average pounds coal per trip	4,860	5,292	6,831
Average tons weight of train	272.1	285.2	294.8
Gallons of water used per ton train	12.83	13.99	12,94
Pounds of coal used per ton train	17.86	18.56	23.17
Water evap. per pound of coal	5.98	6.28	4.65 lbs.
Equivalent evap. from and at 212°	7.18	7.53	5.56
Average temperature of feed water	65°	68°	68°
Average steam pressure, pounds	143	148	136
Percentage value of each	85.79%	89.97%	66.44%

With the small briquettes about half were broken up, the other half going into the firebox whole. The engine did not steam as well as with the large bricks, the fire was dirtier and there was more ashes in the ash pan than with the large bricks. About the same amount of cinders was dumped from the front end, about half a tub* full per single trip. Better results were anticipated from the small briquettes than from the large ones, on account of the latter having to be broke up, with consequent loss from formation of more or less fine material on account of such breakage. It is probable, however, that the reason for the better performance of the large bricks was due to the cementing material used, maltha (residuum from oil), which is a nearly pure combustible material having been used in the large bricks, and asphaltum, which has a much larger percentage of dirt, being used in the small briquettes.

Some briquettes were also made from cinders taken from smokeboxes, using asphaltum as a cementing basis. They were tried in a switch engine in the yard at Sacramento, but it was evident that not much could be done with them in the form of firebox used, of small grate area. Possibly in a Belpaire firebox or one of the Wootten type they could be used to advantage.

The West Shore Road is extending and improving its block system of signals.

The conductor and three brakemen of a southbound freight on the Southern Pacific were attacked at Colmayes, Feb. 4, by five tramps whom they put off the train. The conductor received an ugly gash in the head from a lantern which a tramp took from him. The tramps then proceeded to Baden Station, and misplaced the switches so that a passenger train coming north ran into a number of loaded freight cars on a side track. The train was running slowly as it approached the station, so that no one was hurt, but the locomotive and express car were badly damaged.

* Tub capable of holding 1,000 pounds of coal.

Recent Brake Tests.

A series of air brake tests were conducted by the Chicago, Burlington & Quincy Railway at Burlington, Ia., Feb. 3, 4 and 5; to ascertain the relative merits of the Westinghouse and the New York brakes. The tests were made on the same track that was used for the brake trials at Burlington in 1886 and 1887. All the stops were made running toward Burlington. The train used consisted of 50 34-foot palace stock cars, which were built about three years ago, and had been overhauled within the past two years and fitted with Janney couplers, metal brake beams and quick acting Westinghouse airbrakes. These cars were taken from the road in just the condition they were in service, no preparation whatever being made to fit them for the tests. The braking power is about 70 per cent of the light weight. The piston travel varied from 6 to 9 inches and averaged 7¼ inches, and the average slack between the cars, including the spring slack, was about 10 inches. The brake shoes which were used on the engine and tender were new and did not have a good bearing on the wheels, returned to lap after each application, the results being noted in each car.

For the release tests, 25 of the cars used for the graduating tests were employed standing. A train pressure of 70 pounds was first obtained, the engineer's valve placed at lap and 100 pounds allowed to accumulate in the main reservoir. Full emergency application was then made. The handle was next placed at lap after an intermission of 15 to 30 seconds to insure an equalization of pressure between auxiliary reservoir and cyclinders.

At a signal given from the engine whistle the handle of the engineer's break valve was placed in running position, and observers placed along the train kept a record of the time from the signal to the release of the brakes. In all of these tests communication was established between the dynamometer car and the rear car of the train by telephone. The engineer's valve was also connected to an electric bell in the dynamometer and rear cars, by which the exact time of the application of the brakes by the engineer could be noted. The auxiliary reservoirs and brake cylinders under the front and rear cars were connected to gauges

No. 4—Single Car Test.

This test was to determine if the emergency brake would go on in service application with one car. It was carried out in the same manner as test No. 2.

Westinghouse, new triples, old springs -Reductions, 10 lbs., 5 lbs. 4 lbs.

Dynamometer Car. Train.	Dynamometer Car. Cylinders.
70	0
60	33
57	44
50	50

No. 5—Single Car Test.

This was to determine if the emergency would go on one car with the engineer's valve placed in the service application position releasing all the air from the train pipe.

New York brake—Reductions, 10 lbs., 5 lbs., 4 lbs.

Dynamometer Car. Train.	Dynamometer Car. Cylinders.
70	0
60	32—35
57	45
50	50

Westinghouse, new triple, old spring.—Reduced all air out through full service port. No emergency.

New York brake—Reduced all air out through full service port; Dynamometer cylinder gauges moved up rapidly and then emergency went on. With six cars cut in cylinder gauge moved up rapidly. No emergency.

No. 1 Test—Emergency Test.

	New York Brake—Feb. 3, 1892.					Westinghouse Light Spring—Feb. 4, 1892.				Westinghouse Heavy Spring—Feb. 4, 1895.				Westinghouse Old Triples, Heavy Spring—Feb. 5, 1892.		
Number of stop	No. 1	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3
Time of day	11:52	4:22	12:21	5:24	5:55	10:27	10:45	11:41	11:53	3:22	3:36	3:53	4:26	4:40	4:55	5:25
Number of cars	50	50	49	49	49	50	49	49	49	50	50	49	49	50	50	49
Weather	Clear and dry.					Cloudy and light rain.				Heavy fall of wet snow.				Clear and dry.		
Condition of rail	Good.					Bad.				¼ inch of snow on rail.				Good.		
Train pressure	70	72	70	70	70	70	70	72	70	72	71	68	68	68	67	69
Speed	15	26	31	18	36	23	30	19	36	23	32	22.5	33.5	24.5	31	21
Shock in rear car	+7.9	+5.1	+3.4	+7.6	0	0	+.2	+.1	+.1	+.5	+.8	+.2 / +10.5	−.2	.3	.3	.4
Shock in front car	Slideometer not used.					+2.3	+7.6	+.8	+1.3	+1.3	+2.5	+2.2	+.3	+1.3	+1.6	+.5
Time of shock from movement of engineer's valve.	6	5	5.5	5	6	6.6	6.6	5.4	7	6	—	6	—	6	6.6	6
Cylinder pressure at shock in rear car.	60	55	58	55	58	58	57	58	58	60	60	57	55	55	55	55
Distance run in making stop	93	297	360	156	574	239.3	384.5	162	646	232.5	386.5	238.5	561	283.5	417	190
Time of stop	8	11:5	14:5	10:5	18:2	12	13	11	20.5	11	14	12	19	13	16.5	11.6
Standing test to determine quickness of application	Applied in 3 seconds. 50 lbs. in 4 1-5 seconds.					Applied in 3 seconds. 58 lbs. in 4 seconds.				Applied in 3 1-5 seconds. 59 lbs. in 4 seconds.				Applied in 3 1-5 sec.; 55 lbs. in 4 sec. Train pres. only 66 lbs.		

Remarks.

Shocks mentioned in the table when marked *plus* indicate a movement of the slidometer toward the locomotive, and when marked *minus* indicate a movement backward or toward the rear of the train.

Stop No. 1, A. M., no damage.
Stop No. 1, P. M., broke in two 22d car from front—broken draft spring.
Stop No. 2, broke in two 16th car from front—broken knuckle.
Stop No. 3, no damage.
Stop No. 4, broke in two between engine and dynamometer car—broken link.

Stop No. 1, no damage.
Stop No. 2, broke in two 7th car from rear—tail strap rivets sheared.
Stop No. 3, no damage.
Stop No. 4, no damage.

No. 1 stop, no damage.
No. 2 stop, no damage.
No. 3 stop, broke in two 15th car from front. Heavy surge broke knuckle through pivot pin hole.
No. 4 stop, no damage. Reaction in rear car moved slidometer a little. It occurred 16½ seconds from time of movement of engineer's valve.

No. 1 stop, broke in two 20th car from front. Knuckle broke at tail near lock pin.
Stop No. 2 broke in two 14th car from front. Drawbar pulled out.
Stop No. 3, no damage.
Stop No. 4 was not made, owing to obstruction of track by freight train.
Note.—These triples were cleaned during Nov. and Dec., 1891—last cleaning.

Tests 2 and 3.—Graduation and Release Tests.

New York Air Brake. Car No.	Time of release, seconds.	Graduation. O. K. means that brake applied.	Westinghouse Air Brake—New Valves and Heavy Springs. Car. No.	Time of release, seconds.	Graduation. O. K. means that brake applied.	Westinghouse Air Brake—Old Triple Valves. Car No.	Time of release, seconds.
Engine	Stuck	O. K.	Engine			Engine	
Dyn. Car.	Stuck	O. K.	Dyn car.	50	O. K.	Dyn. car.	30
7,952	Stuck	O. K.	15,773	50	O. K.	15,773	20
305	Stuck	O. K.	1,636	50	O. K.	1,636	25
8,014	Stuck	O. K.	7,530	50	O. K.	7,530	32
1,629	Stuck	O. K.	8,054	50	Did not apply.	8,054	30
7,998	85	O. K.	7,470	50	Cut out; dead lever broken.	7,470	30
1,635	Stuck	O. K.				7,806	10
8,030	25	Did not apply; leak in leather packing.	7,806	65	Came on and blew off at every application.	15,536	15
8,068	Stuck	O. K.				8,337	82
15,967	30	O. K.	15,538	65	O. K.	7,722	70
15,659	.....	This car cut out.	8,338	65	O. K.	4,934	35
15,722	Stuck	First and second did not apply; third graduation O. K.	7,722	65	O. K.	7,544	75
			4,934	65	O. K.	1,656	50
			7,544	30	O. K.	8,384	30
15,684	30	O. K. (Gauges on this car.)	1,656	30	O. K.	15,648	45
			8,384	30	O. K.	8,220	30
3,077	Stuck	O. K.	15,648	30	O. K.	7,712	20
15,799	Stuck	O. K.	1,603	30	O. K.	15,988	40
15,618	Stuck	O. K.	8,226	30	O. K.	393	55
15,958	Stuck	O. K.	7,712	13	O. K.	15,959	38
8,080	Stuck	O. K.	15,988	46	O. K.	8,336	38
8,162	57	O. K.	393	22	First.	1,672	45
8,350	Stuck	First application blew off; second O. K.	15,959	61	O. K.	8,002	60 Went off slowly; retaining valve probably stuck up.
8,136	90	O. K.	8,336	37	First and second application blew off; third O. K.	7,952	60
7,882	Stuck	First and second application blew off; third O. K.				305	21
			1,672	23	O. K.	8,014	20
381	34	O. K.	8,082	23	O. K.		
7,844	Stuck	O. K.	9,160	23	O. K.		
9,160	60	O. K. (Gauges on this car.					

as they had not been in service long enough to become fitted. This was, however, more noticeable during the first day's tests than on the last, as they had become slightly worn during the tests.

In preparing this train for the first tests the Westinghouse triple valve was removed, and the triple valve of the New York Airbrake Company, substituted. With this equipment a standing test and stops Nos. 1, 2, 3 and 4 were made. These triple valves were then removed, and new Westinghouse triple valves substituted which were fitted with a light graduating spring made of Brown & Sharpe's No. 13 wire gauge brass, the same test being made with this equipment. For the next test the light springs were removed from the Westinghouse triple valves, and the heavy springs which were made of brass wire No. 10 Brown & Sharpe's wire gauge, were taken from the old triple valves which had been in use on the cars about two years, and put in the new valves and the same tests made as before. The new triple valves were then removed from the cars and the old ones which had been in service about two years were replaced, and the standing tests and three stops were made with this equipment.

To determine the graduating efficiency of the brakes, 26 cars were used standing still. Gauges were attached to the train pipe, and to the auxiliary reservoirs of the dynamometer car, the central car of the train and the last or 26th car of the train. The train pipe pressure was reduced at one minute intervals and the handle of the engineer's valve placed where they could readily be seen by those taking observations.

Test No. 2—Graduation Test.

Westinghouse, New Triples, Old Springs.
Pressure on engine gauge, 69 lbs.; Reductions, 7½ lbs., 6½ lbs., 4½ lbs., 4 lbs.

Dynamometer Car.		12th Car.		25th Car.	
Train.	Cyl.	Train.	Cyl.	Train.	Cyl.
72	0	64	0	68	0
65	22	58	8	62	7
58	43	52	30	56½	31
54	52	47	47	50½	44
48	47	....	....	.....	..

New York Brake.
Pressure on engine gauge, 69 lbs.; Reductions, 6½ lbs., 6½ lbs., 6 lbs., 5 lbs.

Dynamometer Car.		12th Car.		25th Car.	
Train.	Cyl.	Train.	Cyl.	Train.	Cyl.
70	0	67	0	68	0
62	24	62	5	62	14
58	41	55	22	55	32
49	49	49	36	47½	47½
....	..	43	43	.....	....

Remarks.—In 25th car the gauge on cylinder raised continually from first application to equalization.
In middle car the gauge on cylinder raised almost continuously until 35 lbs., then paused until next reduction.
In dynamometer car the gauge raised after first application continuously and slowly.

The proposition of adding a locomotive to the mechanical engineering laboratory of the Purdue University at Lafayette, Ind., has been under consideration for some time, and the locomotive has now been put in place in the laboratory and adjusted for testing purposes. It is a standard Schenectady American type engine, complete in all respects.

The truck wheels rest on a short section of track, while the driving wheels are supported by a set of flangeless wheels. The axles of these lower wheels are extended at one end and connected to two friction brakes, on the principle of the Alden absorption dynamometer, by means of which the load can be varied and accurately adjusted. These dynamometers are used simply as brakes to supply the desired resistance. In order to measure the tractive power, the draw-bar of the locomotive is connected to a specially designed dynamometer by which the actual traction can be as readily weighed. Revolution counters are connected to the driving wheels and to the bearing wheels, and an index is fitted for showing the longitudinal motion and magnifying it, as the actual travel is only about one-tenth of an inch.

Mr. H. G. Prout, commenting on railroad accidents in 1891, says in the *North American Review*: "The number of passenger trains involved in accidents during the year was not far from 850 or 900, but the number of accidents was, of course, somewhat less, as there were a good many collisions involving two passenger trains. The first great fact that appears is that twenty-two of them might have been prevented had employés obeyed orders. They were not called to exercise wit or judgment in alarming emergencies. but simply to obey orders. Space and time are lacking to discuss the measures that operating officers take to maintain discipline and the difficulties that they encounter. It is enough to say that this is the most troublesome part of their duties, and that the unions, instead of helping, have made matters worse.

"We may hope that this is a passing phase of trade unionism, and that as the men learn more of their proper relations to the rest of the world, they will discover that it is for their own interest to weed out the insubordinate, the inefficient and the drunken. The next striking fact is that nineteen of these accidents would probably have been saved by block signals and interlocked switches and signals. I would not say unqualifiedly that every one of the roads on which these accidents happened should at once equip its tracks with block signals and interlock all of its switches. There are reasonable limits within which they must work; but it may be said without qualification that it is poor railroad economy to operate a road having a heavy and fast traffic without block signals and interlocking for the protection of switches."

Bearing Metal Alloys.*

BY C. B. DUDLEY.

The amount of metal used to make bearings is something enormous. To my knowledge one large corporation uses not less than 1,000,000 to 1,250,000 pounds per year of bearing metal, and it can readily be seen why this should be so from knowing that each bearing weighs from 10 to 15 pounds, and that each car has not less than eight, while some cars have 12. It is a fairly good bearing metal that will not lose as much as a pound of its weight in a single bearing for every 25,000 miles that it goes under a car.

There may be five characteristics of a good bearing metal.

(1) The bearing must hold up the load. It is doubtless well-known that in railroad practice the pressure per square inch on the bearing metal is frequently as high as 350 to 400 pounds, and consequently it is absolutely essential that the bearing metal should be of such a nature that it will sustain this pressure without distortion.

(2) Another requisite of a good bearing metal is that it does not heat readily. Upon this point there is not as much information as could be desired. The general tendency of all the information which is at hand on this subject, is that the harder the bearing metal is, the more readily it will heat, or to put it in another form, the softer the alloy, the less liability there is for the bearing to get hot in service.

(3) Another important requisite of a good bearing metal is that it shall work well in the foundry.

(4) A good bearing metal should show small friction. Upon this point it may be urged that the friction is almost wholly a question of the lubricant used, and all the experiments that I have seen confirm this view to a greater or less extent, namely, that the largest portion of the friction between a bearing and a journal, is a function of the lubricant used. On the other hand, the nature of the bearing metal does certainly have an influence, and a good bearing metal is one which makes that element of the friction depending on the bearing metal as small as possible. I do not know of much experimentation on this subject. Such experiments are extremely difficult to make on account of the large number of variables, notably temperature, quantity of oil between the surfaces, pressure, speed, relative smoothness of the journal and bearing, etc. It is very greatly to be desired that careful experimentation in this field should be made.

(5) It is extremely important that a bearing should give high mileage with small loss of metal by wear. It has already been stated that the average bearing metal used under cars loses one pound for every 25,000 miles that the bearing goes. Many bearing metals wear much faster than this, and some slower, but other things being equal, no one will dispute that that bearing metal is best which wears the slowest.

The common metals from which alloys are made for bearings may, perhaps, be enumerated as follows: Copper, tin, lead, zinc, antimony, iron and aluminum.

Most people are aware that 15 or 20 years ago the standard metal used in car bearings, and other places, was a simple copper-tin alloy, containing seven parts of copper to one of tin. Indeed, some railroads, if I am rightly informed, and some builders of machinery, even at the present time use cannon bronze, or the seven to one copper and tin alloy as bearing metal. It will be seen as I proceed that we regard this as a serious mistake; that while perhaps we do not know what the best bearing metal is, we do know something very much better than the copper-tin alloy.

It will perhaps be essential to describe the method of experimentation before proceeding to show what modifications in the copper-tin alloy have been made use of in trying to throw some light on the question of the best bearing metal alloy.

The method in all cases has been to have a certain number of bearings made of a standard bearing metal, which will be described later on, and the same number of bearings of the experimental metal. These bearings were placed on opposite ends of the same axles, either on locomotive tenders or on cars, one-half of the standard and experimental bearings being on one side of the car, and the other half being on the other side, but in all cases a standard bearing and an experimental bearing on opposite ends of the same axle. The bearings were all carefully weighed before going into service, and after a sufficient lapse of time were taken out and re-weighed. At first an attempt was made to give the loss of metal by referring it to the mileage, but the described method of comparison was ultimately adopted, as giving results free from any possible difficulties introduced by mileage, so that all the results which we obtained are strictly comparative.

Of course, owing to the exigencies of the service, it sometimes happened that some of the bearings put in use were not returned to be weighed. Whenever, from any cause, a bearing was missing, its opposite was not taken into account.

The method was to compare the relative loss of metal by wear of various alloys with a certain standard alloy. It should be stated that likewise observations were made on the behavior of the experimental alloys as to heating. No observations were made as to the difference in friction with the different alloys, This field is entirely unexplored so far as I know. The first test was a comparison of the old copper-tin alloy with the standard phosphor-bronze bearing metal. The results obtained were as follows:

COPPER-TIN VS. PHOSPHOR-BRONZE.

	Composition Copper-Tin. Per cent.	Composition Phosphor-Bronze. Per cent.
Copper	87.50	79.70
Tin	12.50	10.00
Lead	None	9.50
Phosphorus	None	0.80

Wear.—First experiment, copper tin wore 48 per cent faster than phosphor-bronze; second experiment, copper tin wore 53 per cent. faster than phosphor bronze; third experiment, copper-tin wore 47 per cent. faster than phosphor-bronze.

It should be stated that the analyses are approximately average analyses, rather than special analyses of the samples in each test, and it will be observed that there is no allowance for small impurities of zinc, iron, antimony, etc. It will be observed also that in expressing the loss of metal by wear, the loss is given in percentages of loss of metal compared with standard phosphor-bronze. It is entirely clear, we think, from the above experiments that the copper-tin alloy of seven to one, is nothing like as valuable as the standard phosphor-bronze for bearing metal, and this view is confirmed from knowing that the experiments above given were made on some hundred bearings of each kind, and that a much larger percentage of the copper-tin bearings heated than the phosphor-bronze. So satisfactory were these experiments that the phosphor-bronze bearing metal was for quite a long time used as the standard bearing metal for car bearings on the Pennsylvania Railroad. It was not deemed advisable to allow the matter to rest there, and accordingly experiments have constantly been in progress to secure modifications which would give better results. Just here I would like to call attention to two points. First, the copper-tin bearing metal differed from the phosphor-bronze in several particulars. First, there is less tin; second, there is quite a percentage of lead, and third, there is some phosphorus.

It is not intended to give the results of all the tests that have been made during the last fifteen years, but only a selection from them, as the tests given apparently illustrate a law, and show the development of our knowledge leading to present practice. Accordingly, the next experiment will be one which we think throws considerable light on the matter, namely, an experiment with arsenic-bronze. It has been found that arsenic practically takes the place of phosphorus in a copper-tin alloy. Accordingly, several experiments were made with arsenic-bronze. The results of these experiments are as follows:

First Experiment.

	Composition arsenic-bronze. Per ct.	Composition phosphor-bronze. Per ct.
Copper	89.20	79.70
Tin	10.00	10.00
Lead	none	9.50
Phosphorus	none	0.80
Arsenic	0.80	none

Arsenic-bronze wore 42 per cent. faster than phosphor-bronze.

Second Experiment.

	Composition arsenic-bronze. Per ct.	Composition phosphor-bronze. Per ct.
Copper	79.20	79.70
Tin	10.00	10.00
Lead	7.00	9.50
Phosphorus	none	0.80
Arsenic	0.80	none

Arsenic-bronze were 15 per cent. faster than phosphor-bronze.

Third Experiment.

	Composition arsenic-bronze. Per ct.	Composition phosphor-bronze. Per ct.
Copper	79.70	79.70
Tin	10.00	10.00
Lead	9.50	9.50
Phosphorus	none	0 80
Arsenic	0.80	none

Arsenic-bronze wore one per cent. faster than phosphor-bronze.

"K" BRONZE VS. PHOSPHOR-BRONZE.

	Composition damascus-bronze. Per ct.	Composition phosphor-bronze. Per ct.
Copper	77.00	79.70
Tin	10.50	10.00
Lead	12.50	9.50
Phosphorus	None	0.80

First experiment, damascus-bronze wore eight per cent. slower than phosphor-bronze; second experiment, damascus-bronze wore 7.30 per cent. slower than phosphor-bronze.

It will be observed that the first experiment was practically a copper-tin alloy containing some arsenic, and that this wore very nearly as fast as the copper-tin alloy, seven to one. I have been accustomed to regard this experiment as indicating that the phosphorus in bearing metal alloys does not have very valuable influences on the wear, and seems to be more valuable in the foundry than in the service. This second experiment, it will be noted, differs from the first in introducing some lead in the alloy, and it is extremely interesting to note that although the arsenic and tin remain the same as in the first experiment, the introduction of the lead produces a diminution in the rate of wear which is very marked. After this experiment was concluded, a third experiment was tried in which the composition of the arsenic-bronze was patterned as near as possible after that of the phosphor-bronze, and it is interesting to note that in this case the wear of the two was almost the same. The heating of the arsenic-bronze alloys in service was no greater than the phosphor-bronze, and there were no other appreciable differences to be discovered in the behavior of the metal, except as the figures above show the rate of wear.

It is interesting to note that these experiments thus far made seem to indicate first, that the introduction of phosphorus or arsenic into a bearing metal has very little influence on the rate of wear, while the introduction of lead has a very marked influence on the rate of wear. In view of these teachings, it was decided to extend still further the influence of lead on bearing metal. Accordingly, a bearing metal was obtained which contained still more lead than the standard phosphor-bronze. This metal we will call "K" bronze. The result of the experiment with "K" bronze is as given above.

This experiment, to my mind, is extremely interesting. It should be said that no trouble was experienced from heating with the "K" bronze, more than with phosphor-bronze, and no other peculiarities, other than the rate of wear as given, were observable. There is no phosphorus in the "K" bronze; practically the same tin, and an increase in lead, and as the result of these changes, the "K" bronze, as will be observed, surpasses the phosphor-bronze in wear.

The value of lead in a copper-tin alloy for bearing metal, being apparently so well established, it became a question of how much lead could be gotten into the alloy without running into difficulty. Also about this time there began to be evidences of a law governing the composition of all bearing metal alloys, which law may be briefly stated as follows: That alloy which has the greatest power of distortion without rupture, will give best results in wear. In accordance with this law we started to design an alloy which would have as great a power of distortion as possible without rupture.

After experimenting somewhat we finally decided on a proportion of copper and tin, about nine and one half parts copper to one of tin. We have some evidence, obtained since the experiments I am about to give were made, that indicate that we could have gone still farther, and made the ratio of copper to tin, 12 or possibly 15 copper to one of tin. The ratio of copper to tin having been established, the question of how much lead to use came up, and as a consequence the question of the influence of lead on a copper-tin alloy arose. I do not think that this point has been fully worked out, but as far as we have gone, the indication seems to be that the addition of lead has much the same influence on a copper-tin alloy, that a still further diminution of tin would have That is to say, if an alloy of copper and tin is made, fifteen parts copper to one of tin, it will probably have much the same physical properties, and give much the same results in wear, as an alloy of ten parts copper to one of tin, which alloy contains quite a large percentage of lead. It should be stated here, that as the amount of tin is diminished, and the amount of lead is incresed, the tendency of the metal to yield more readily under pressure increases, so that it becomes essential to guard against possible danger of having a metal which would yield too readily under the load. After considerable preliminary work, bearings were cast, and a wearing test made, the results of which are as follows, the new metal being called alloy "B."

ALLOY "B" VS. PHOSPHOR-BRONZE. PHYSICAL PROPERTIES.

	Composition alloy "B." Per cent.	Composition phosphor-bronze. Per cent.		Alloy "B."	Phosphor-bronze.
Copper	77.00	79.70	Tensile strength, per square inch, pounds	24,000	30,000
Tin	8.00	16.00			
Lead	15.00	9.50			
Phosphorus.	none	0.80	Elongation, per cent.	11	6

Wear.—Experimental alloy "B" wore 13·50 per cent. slower than phosphor-bronze.

It will be observed that this alloy wears considerably better than the standard phosphor-bronze, and the best of any in the series; also that it is lower in tin, and higher in lead than the phosphor-bronze. It will also be observed that the physical properties of alloy "B" were taken in comparison with phosphor-bronze, and that the characteristics are that alloy "B" has a lower tensile strength, but a greater elongation than the phosphor-bronze. It is well known that the elongation measures to a greater or less extent the capacity of the metal to suffer distortion without rupture. Some experiments have been made toward still further diminishing the tin and increasing the lead, but it is found that a certain amount of tin is necessary to hold the lead alloyed with the copper, and apparently the limit of the diminution of tin and increase of lead is not a great ways from the composition of alloy "B."

The formula used on Pennsylvania Railroad in making the standard bearings patterned after alloy "B," is as follows:

	Pounds.
Copper	105
Phosphor-bronze, new or scrap	60
Tin	9¾
Lead	25¼

By using ordinary care in the foundry, keeping the metal fairly well covered with charcoal during the melting, it is entirely possible to get perfectly successful castings in car bearings on the above formula. The copper and the phosphor-bronze can be put in the pot all at once before putting in the melting hole. The tin and lead should be added after the pot is taken from the fire.

It is of course a fair question whether the introduction of a little zinc, or possibly some other combinations of the six or eight metals commonly used for alloys, will not give a bearing metal much better than the alloy "B." All that I can say on this point is that alloy "B" represents the best knowledge that we have on the subject at present, and the whole thing may be summed up by saying that at present the best bearing metal that we know of is a copper-tin-lead alloy, containing a small amount of phosphorus, in which the proportions of the constituents are approximately those shown above.

*Abstract from the *Journal of the Franklin Institute.*

A Ride on a Honduras Railroad.*

First of all was a wheezy, little, old engine, at the throttle of which stood a driver—we engineers never call him anything else—as black as Erebus, but the very soul of good humor. Two natives sat in front where the pilot had once been, with a box of sand between them, which they applied to the track as occasion required. Back of the engine were two of the most unutterably dilapidated flat cars that eyes of mortal ever saw; while the second class passenger coach, with its roof off, left its passengers exposed to the broiling sun. The train concluded with a first-class coach a century old. A long wooden bench stretched from one end to the other of the car on the larboard side; the starboard side had been ornamented with a similar device at the time when the "morning stars sang together," but now it lay broken among the rubbish and cigar stumps and boxes that some generous Honduras travelers had strewn around. There was not a brake on the entire train, nor was there a sign that there had ever been one, and I doffed my hat before those hoary old ruins with the reverential awe that all time-honored relics inspire in me. The conductor of this rare aggregation of antiquities was a tall, sunburned specimen of humanity with linen clothes and straw hat, who hailed from Chicago, as genial and honest and good natured a man as ever pulled a bell-cord or punched a ticket. He looked and behaved as though he were born to the trade, and fitted into the hot sun and waving palms of the tropics as nicely as though the energy and stir of Chicago had never warred about him. After an amount of whistling that left only steam enough for an asthmatic wheeze, the little engine pulled out of the station. Soon we stopped to fill up the sand box; another move and we stopped for water; then we stopped while the conductor hunted up a carpenter and gave him time to repair the first-class coach; then we stopped for wood; then we stopped to give me an opportunity to take some photographs; then we stopped for dinner; then we stopped while the conductor conducted a drunken passenger to his home and had a little chat with his family; then we stopped to take a drink; then to put the train on the track; then we stopped for the fun of it. There were more stops altogether than on any grand organ I ever saw. We were allowed to ramble through the fields or in the woods as the case might be, and then the conductor escorted us all back to the palace car. Talk about your accommodation train! But the roadbed! Oh, shades of Cooley and Eads and all the rest of you. That was what gave me my passion for civil engineering. It danced up and down like a Norman colt on a frosty morning; it dodged in and out in a way that made me dizzy to contemplate, and would fill with astonishment the right honorable first vice-president of this society. But, like the Cunard line, the Interoceanic has never lost a man, and with unflinching faith in destiny I held on while that old caboose sped by bank and jungle over 37 miles of jagged iron. Talk about the blue laws and witch burning and the inquisition! I want to say to you, gentlemen, that the civil engineer that could evolve a road like that, that would lacerate a man's body and destroy his piety, that would set his head and stomach to aching and make him heart-sick and home-sick and sea-sick, is worthy the place that the most lurid theology has ever painted. It was months before I could face a civil engineer without feeling a great deal of sympathy for myself.

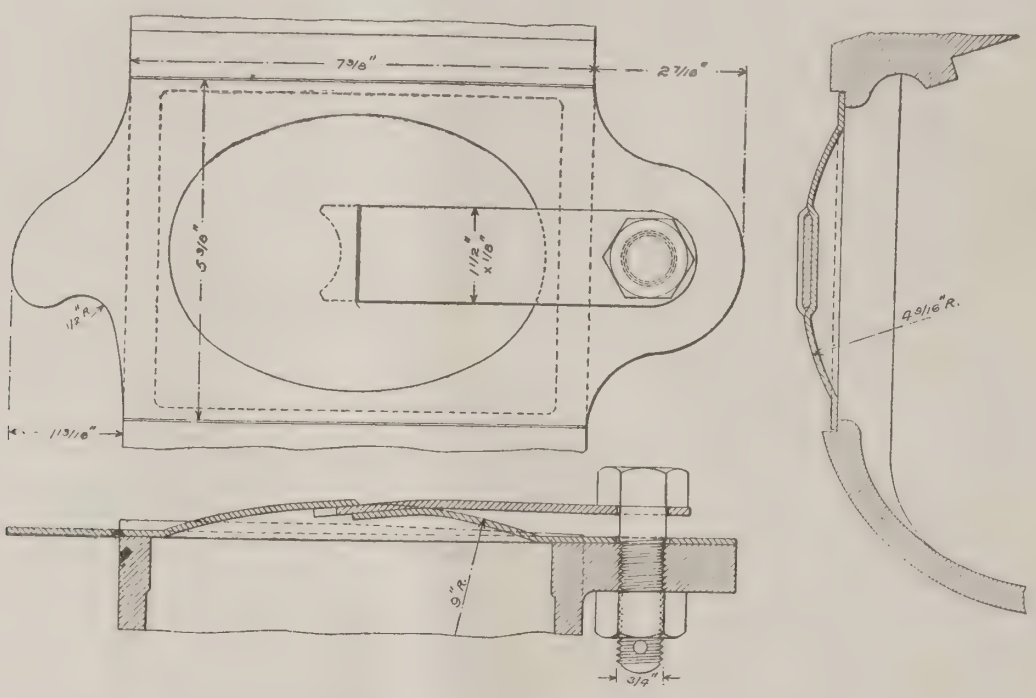
*The Rev. Conrad Haney, addressing the Western Society of Civil Engineers.

The Atchison, Topeka & Santa Fé has recently ordered a large number of cars from the Barney & Smith Manufacturing Company and the Missouri Car & Foundry Company, for delivery in March, April and May. The orders include 2,000 box, 500 platform, 500 stock and 250 refrigerator cars, 15 cabooses, 35 chair cars, 10 ordinary passenger and 8 baggage cars. The cars will have the Westinghouse brake and Safford drawbar.

Air plows, V-shaped contrivances, to be placed on the front of engines of fast express trains, are the latest scheme to get more speed, by overcoming much of the natural resistance of the air to the front of the locomotive. The plow extends from a few inches above the track to the top of the smokestack, the sharp edge, of course, in front. "Shoveling fog" is a common expression among railroad men, but plowing wind is a new thing in railroad agriculture.—*English Mechanic.*

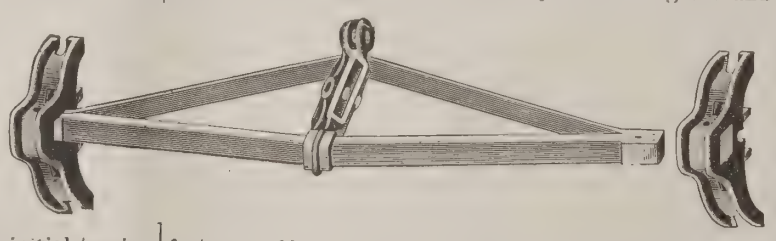
Drexel Journal Box Lid.

The Drexel Journal Box Lid has six points of advantage which are as follows: First: The pressure of the spring is directly upon the center of the lid instead of either at the top or side, thus distributing the pressure evenly and keeping the lid close to the box at every point of its edges. Second: The spring, being simply a flat piece of untempered spring steel placed in an unexposed position, reduces the liability of breakage to the minimum, at the same time furnishing the maximum amount of strength. The pressure of the spring at its bearing point on the lid is nearly twice as great as that of any other device now in use. The combination of this additional pressure with the absolutely uniform lightness of the lid, makes the cover a near approach to an absolutely dust-proof condition. Third: Should the spring break, the lid will still rest on the opening in the box as the bolt will not allow it to swing down clear on the lower shelf. Fourth: The lid being of mild pressed steel, is little liable to breakage. If the spring breaks, the lid is still unharmed and needs only a new spring inserted to make it as good as new. The saving effected in maintenance by this feature alone is very large. Fifth: It requires no nicety of adjustment in setting up, and on that account reduces the expense of the item to car builders. Sixth: The spring cannot be rendered useless by rough usage or unnecessary jerking in opening the lid. It can be used without any change or alteration on the M. C. B. Standard Journal Box of 1890, and by a very slight change adapted to the Standard of 1891. Sold by the Drexel Railway Supply Company, The Rookery, Chicago, or 29 Broadway, New York City.



The Kewanee Steel Brakebeam.

The accompanying cut shows the "Kewanee" Rectangular Steel Brakebeam. The compression member is a rectangular steel tube, the long side of rectangle being placed vertically. The tension member is made of a flat bar of open hearth steel which is bent around the ends of the tube, as shown. The heads are of malleable iron, or cast steel, and are shunk on to ends of beam over the tension and compression members, thus holding all parts firmly together to prevent deflection of beam under load. The strut is made of malleable iron, or cast steel, having a third point of support. The construction of the beam is as follows: The strut is first shrunk over compression member. The tension member is heated in a furnace to a red heat. It is then by means of a special machine shaped to position and the ends bent around the ends of compression member. The heads having been previously heated, are then put over the ends, and fastened by a rivet. When the beam cools, there is an initial tension in the tension member, which pulls a camber into the steel tube of three-quarters of an inch. The beam has been thoroughly tested by R. W. Hunt & Co., and found to meet the requirements of the M. C. B. Association standards. One of the most important claims for the beam is its vertical stiffness.



It has no nuts or bolts, and no loose parts to get out of adjustment. The beam will go where any metal beam will. The weight of passenger beam is 75 pounds; the weight of frieght beam, 65 pounds. The beam is manufactured and sold by The Northwestern Equipment Company, The Rookery Chicago.

Editor National Car and Locomotive Builder:

We are giving special consideration to the manufacture of high grade steel plates for locomotive fireboxes and shells, and are especially fitted up for cutting circular plates on patent circle cutting shears, flanging heads by machinery, etc.

As general railway agents for the sale of these products to railway companies exclusively, we beg leave to announce that we have secured the services of Messrs. F. W. Coolbaugh and L. R. Pomeroy, who are well and favorably known to the railway officials of the country, and who formerly served Carnegie, Phipps & Co., Limited, in a like capacity.

We bespeak for Messrs. Coolbaugh & Pomeroy the success that must follow earnest, well directed and straight forward efforts.

We are willing to let the character of our steel and our method of doing business speak for themselves. The fact that we made, about seventy-five years ago, the first boiler plates manufactured in America and shipped part to England for locomotive works there, and have been continuouly in the business since, having manufactured steel plates for twelve years, is sufficient guarantee as to our knowledge of the business.

We have our own steel plant and a larger steel plate mill than any west of the Alleghany Mountains. Can roll plates up to 116 inches wide. Annual capacity, 50,000 tons of plates. We make nothing but plates, and as our whole attention is given to their manufacture we feel that we can better serve our customers than those whose product is more varied.

Yours truly,

LUKENS IRON AND STEEL CO.

The Consolidated Car Heating Company informs us that it has been favored with a most prosperous business for the four months ending Jan. 1, 1892, They have furnished to railroads 13,459 steam couplers, 459 complete car equipments and 162 locomotive equipments. The Old Colony Railroad has had 99 equipments, the Boston & Maine 175, the Canadian Pacific 45, the Concord & Montreal 64 and the Wagner Palace Car Company an average of 10 equipments a month. The Canada Atlantic, the "Soo" line and all the Vanderbilt lines are also large dealers with the Consolidated Company, which reports having on Jan. 1 orders yet to be filled for 130 complete car equipments. By permission of the purchasing agent of the Wagner Car Company, the Consolidated Company also announces that the Wagner Company has adopted the Improved Commingler (McElroy) system as well as the Sewall coupler.

The Chicago & Northwestern Railway has contracted with the Hall Signal Company for the equipment of 87½ miles of its road with the Hall automatic electric system of signals. This will involve the erection of 201 block signals, 188 switch connections and 52 highway and crossing signals. Green is to be the safety color.

The largest brush manufactory in the United States is that of John L. Whiting & Sons at Boston, Mass., established in 1865, and at first doing a small business under adverse circumstances, they have steadily and rapidly increased their business until now they are by far the largest manufacturers of brushes in the United States. They are also the largest manufacturers of brushes for the use of painters, varnishers, kalsominers, etc., in the world. They are the largest consumers of bristles in the world. One-quarter of all imported into this country are bought and used by them in the manufacture of their goods, besides a large fraction of the domestic product.

They turn out a great variety of brushes of all kinds and of very superior and durable quality.

The Cleveland Twist Drill Co. have issued a very neat calendar, diary and memorandum combined for 1892.

An amusing incident is related of Mr. William F. Hallstead, the present General Manager of the Delaware, Lackawanna & Western. While he was Superintendent of the Buffalo division there was an old track foreman, a Mr. C., whose abilities were highly appreciated by Mr. Hallstead and who was just about as abrupt in his speech as the superintendent himself. One day Mr. Hallstead was watching a gang of men at work under the superintendence of Mr. C. Observing a number of new railroad ties lying in a ditch alongside the track. Mr. Hallstead called the track foreman's attention to them in this way:

"C., what the h——l are those ties doing down there in that water?"

Mr. C. turned around deliberately, looked at the ties, and then turning to Mr. Hallstead said slowly:

"Well, Bill, I've been looking at those ties off and on for a week past, and I'll be d——d if I've seen them do anything yet."

When a person cannot find Dixon's American graphite pencils in the hands of dealers, he is invited by the Jos. Dixon Crucible Company, Jersey City, N. J., to send 16 cents in stamps for samples.

The Midvale Steel Company have been turning out some remarkable steel castings, one of which recently was a box slide casting for the 12-inch turret mount for the "Puritan." Table I. shows the Government specifications under which the casting was made, and Table II. gives the results of tests of the physical characteristics of the steel.

I.

Tensile strength	65,000 lbs. per square inch.
Elastic limit	25,000 " "
Extension	15 per cent.
Contraction	25 "

II.

Tensile strength	65,174 lbs. per square inch.
Elastic limit	31,058 "
Extension	25.10 per cent.
Contraction	35.04 "

The Westcott Chuck Company, of Oneida, N. Y., have issued a new catalogue which shows that they have begun making several new sizes of face plates for their lathe, independent, and cutting off chucks and cutting arbors, also new sockets for holding taper shank drills in chucks.

Mr. Chas. Sullivan has resigned his position as Superintendent of the Boyden Brake Company, and is now the Superintendent of the Northern Equipment Company, of Chicago, with offices at 632 Rookery Building.

Mr. M. R. Clapp, formerly with the Hinson Car Coupler Company, is now representing Wm. C. Baker's car heaters as Western Manager with offices at 223 Phenix Building, Chicago.

The Detroit Steel & Spring Company's works are running to their full capacity, and are employing 275 hands. The output last month was greater than during any similar period in the company's existence. Over 600 tons of railroad springs were manufactured in addition to a large output of forgings, castings, tool steel and merchant bar.

SATISFACTORILY EXPLAINED.—Squire Oshkosh (to Operator in Western office)—Look here, this 'ere telegram from my son Rube don't sound like him. It is too kind of sharp and pointed like. Haven't you made some mistake?

Operator—Oh, that's all right! You see our wires are down west of here, and we have been working about sixty miles over a barbed wire fence.—*Puck.*

The statement of earnings of the Southern Pacific for 1891 gives the gross earnings as $50,440,000; operating expenses, $31,164,000; net earnings, $19,280,000, or $2,080,000 more than in the previous year.

Our Directory.

Allegheny & Kinzua.—C. V. Merrick has been appointed Superintendent, with headquarters at Bradford, Pa., vice C. D. Williams resigned.

Atchison, Topeka & Santa Fé.—A. P. Tanner has resigned as Superintendent of lines east of the Missouri River.

Boston & Maine.—J T. Furber, Vice-President and General Manager, died at South Lawrence, Mass., Jan. 27. A. R. Barrett, had been appointed Superintendent of Motor Power, to succeed the late W. Smith. J. W. Sanborn has been appointed Acting General Manager. C. L. Aiken has been appointed Division Master Mechanic in place of A. R. Barrett.

Central New England & Western.—A. A. McLeod has been elected President.

Chicago, Fort Madison & Des Moines.—J. F. Tucker has been elected Vice-President and General Manager.

Chicago, Milwaukee & St. Paul.—J. M. Bunker has been appointed Superintendent of the James River division, with headquarters at Aberdeen, South Dakota.

Chicago & South Bend.—C. A. Carlisle has been appointed Assistant General Manager and Purchasing Agent, office at South Bend, Ind.

Cleveland, Cincinnati, Chicago & St. Louis.—W. Gibson has been appointed Superintendent of the Cincinnati division, headquarters at Cincinnati, O. E. P. Boatman has been appointed Master Mechanic of the shops at Ludlow, Ky.

Great Northern.—F. Bruce has been appointed Master Mechanic at Barnesville, Minn.

Knoxville & Augusta.—Gen. R. N. Hood, President, died at Brunswick, Ga., Feb. 11, 1892.

Louisville, New Albany & Chicago.—J. Henry has been appointed Master Car Builder of the shops at Monon, Ind.

Louisville, New Orleans & Texas.—M. B. Cutter has been appointed General Superintendent.

Missouri, Kansas & Texas.—J. Doyle has been appointed Master Car Builder, with headquarters at Denison, Tex.

New Orleans, Ft. Jackson & Grand Isle.—J. S. Landry has been appointed Superintendent, vice C. S. Dwight.

New York, Lake Erie & Western.—A. Walter has been appointed General Manager. W. L. Derr has resigned as Superintendent of Delaware Division.

New York & New England.—D. H. Nichols has resigned as General Superintendent, and will return to the West. W. S. Jones has been appointed Superintendent of the Providence Division, vice L. W. Palmer, resigned.

Wheeling & Lake Erie.—F. R. Lawrence has been elected President, vice M. D. Woodford, resigned. A. G. Blair has been appointed General Manager.

Wanted.

MECHANICAL ENGINEER—Leaving service of railroad company will open office in Indianapolis, Ind., April 1st, desires to represent Eastern or Western railway supply firm. Address J. S. T.,
124 East Vermont Street,
Indianapolis, Ind.

No. 4 Plain Milling Machine.

The machine illustrated herewith is made by the Brown & Sharpe Mfg. Co., of Providence, R. I.

The overhanging arm supports the outer end of the cutter arbor, either on the center or in a bushing, and may be rigidly connected with the knee by an arm brace. The spindle boxes are bronze. The saddle rests directly upon the knee, and the platen is heavy and moves only at right angles with the spindle. It has three T-slots, and is surrounded by a channel for oil. The spiral head and foot stock are not furnished with the machine, and no provision is made for cutting spirals.

In other respects the machine is similar to No. 1 Universal Milling Machine with overhanging arm.

The platen is 32 inches long and 7 inches wide. It has an automatic feed of 20 inches, and may be stopped automatically at any point while moving in either direction. It can be lowered 18⅛ inches from the center of the spindle, and the saddle has a movement of 6¾ inches in line with the spindle. The greatest distance from the center of the platen to the face of the stand or knee slide is 11 inches. There are six changes of feed varying from .008 to .100 inches per revolution of the spindle.

Each machine is furnished with a "Treatise on the Construction and Use of Milling Machines," a swivel vise, an arm brace, a collet, two platen stops, a hand wheel, an oil can, wrenches, and complete overhead works.

The vise swivels and has a graduated base. The jaws are 5⅛ inches wide, 1⅛ inches deep, and will open 2¾ inches.

The overhead works have two friction pulleys 14 inches diameter for 3½-inch belt, and hangers with adjustable and self oiling boxes. Floor space, 64½ × 44 inches. Manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I.

At the regular quarterly meeting of the directors of the American Steel Wheel Company, held Jan. 19, Mr. G. W. Cushing was elected general superintendent, in charge of the mechanical department of the company, at South Boston, Mass., and the new works about to be erected in New Jersey. Mr. Cushing's office will be at First and I streets, South Boston, Mass.

Editor National Car and Locomotive Builder:

Our attention has been drawn to a most untruthful publication in the New York papers that our company had failed. We wish you to kindly publish in your next issue our emphatic denial of the statement. The rumor has probably grown out of the fact that we last week instituted insolvency proceedings against a creditor in Boston who is owing us quite a large amount, and evidently the Associated Press dispatches have the affair mixed, "putting the cart before the horse."

Yours very truly,
THE GLIDDEN & JOY VARNISH CO.

The Fox Universal Trimmer.

The accompanying illustrations present a front and back view of the Fox No. 4 B trimmer. The machine is made from entirely new patterns. The bed is strongly ribbed, of ample thickness, and sets low on the bench. Stops are provided at each end of the bed which limit the motion of lever and prevent the gear moving too far and coming out of the rack. Motion is imparted to the carriage by means of a loose pinion rolling between the two racks. The lever and pinion are steel castings, admitting of a powerful leverage, which is equal at all parts of the stroke.

The carriage has very long bearing, both top and bottom, and is made very stiff by the rack and ribs extending across the face. It has an oil chamber, both top and bottom, with connecting passage, insuring complete lubrication. Oiling through the one hole in the frame reaches all the wearing parts. The shields completely protect the operator and the point of the knife. They are made detachable for the convenience of shipping.

The Fox Machine Company is meeting with remarkable success in the sale of this machine to all wood-working establishments, and now have over 5,000 of them on the market. The best evidence they have as to its merits is the large number of orders they are receiving from their early customers, which indicate that their machines are approved by those who have used them the longest. Manufactured by the Fox Machine Co., Grand Rapids, Mich.

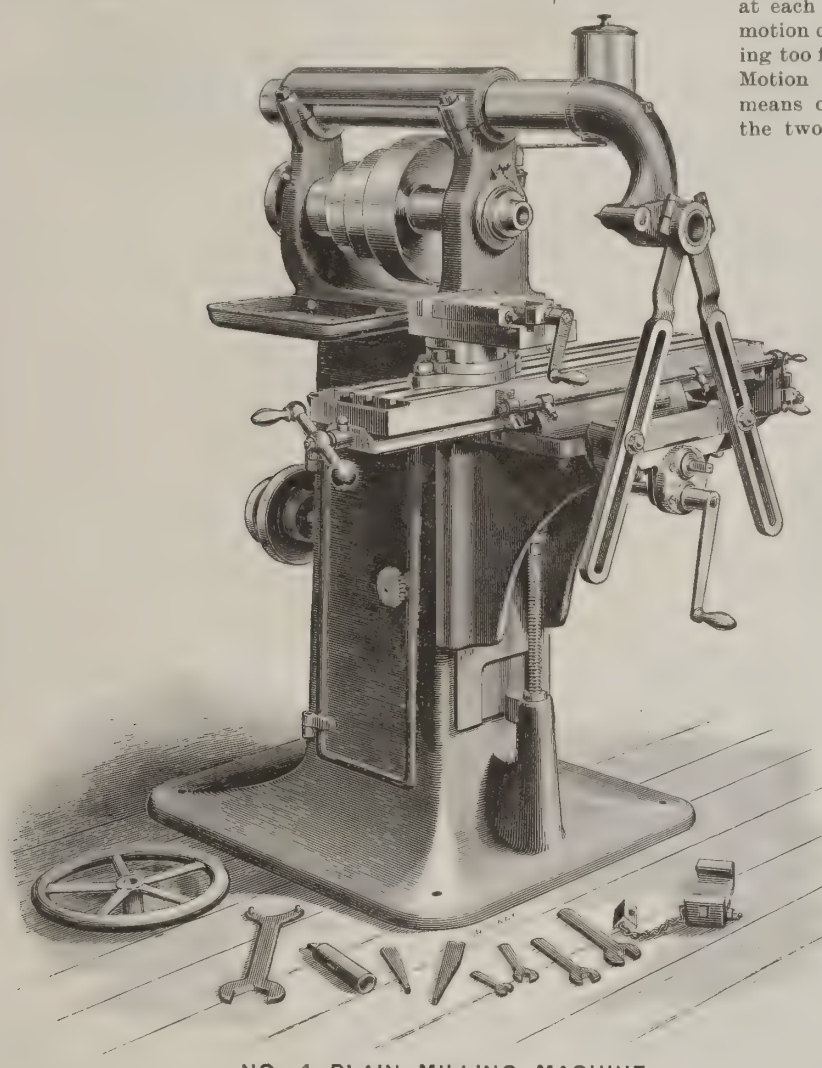
The Scarritt Furnishing Company are quite busy in their works, having large orders for the Chicago, Rock Island & Pacific, Chicago, Milwaukee & St. Paul, Chicago & Alton Chicago & Northwestern, Chicago, Burlington & Quincy; Queen & Crescent, Nashville, Chattanooga & St. Louis, Texas & Pacific, Wabash and many others.

Standard Shaper.

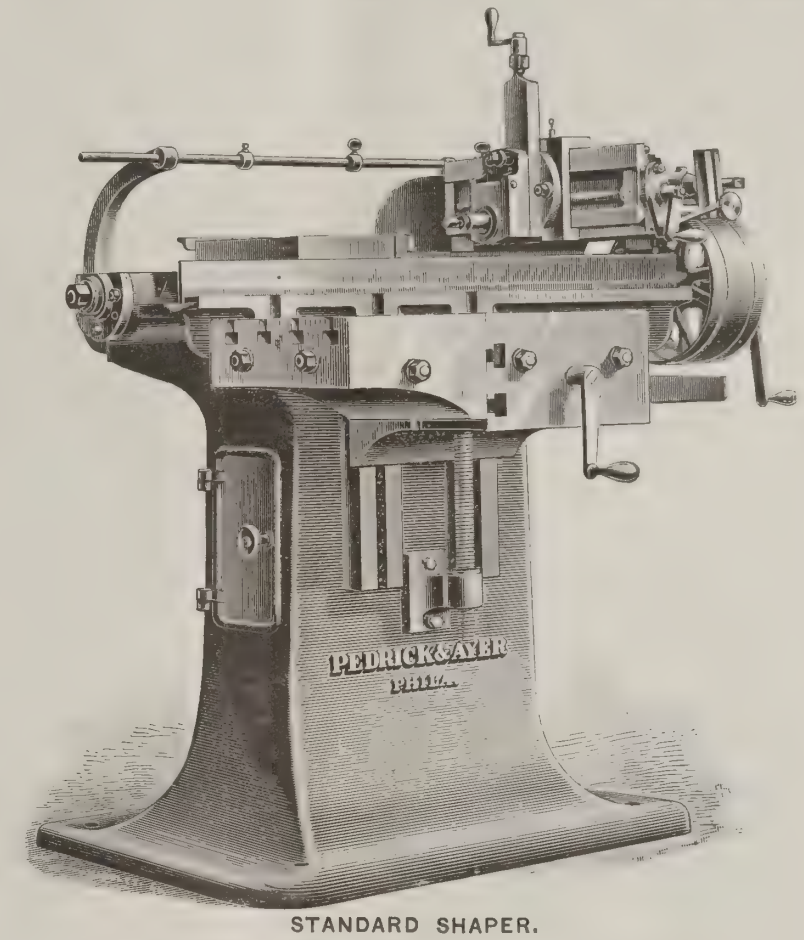
The machine here illustrated planes 12 inches wide by 30 inches long. It is a column machine, with an adjusting table 14⅛ inches long and 14⅛ inches wide, and an auxiliary table 11 inches long to bolt to same when a longer table is desired. This smaller table takes off and leaves an angle plate to bolt long pieces against the table proper. This table is raised and lowered by crank and screw with gibs, that carry it true in its upward and downward travel. The arm that travels and carries the cutting tool is designed to resist all cutting strains, and as true work is done at the outer end of the arm as close to the column. The tool slide has a downward feed by hand of six inches, and a cross feed by power. It is on a swivel base, and angle work can be planed. The machine is driven by 12-inch pulleys and a 2-inch double-thread screw to the desired cutting speed, with a quick return two and a half times as fast as the cutting speed. It has a locking device for holding the tool slide solid while siding down or doing angular work. On the sliding head, in front of the operator, is a light cast-iron cover that forms a tool shelf for keeping the cutting tools. On square tables there is another shelf for wrenches, oil can, waste, etc., both being convenient and useful. This machine will do any kind of work that can be done on the ordinary ram shaper, and good true surface work also, It is particularly valuable for cutting keyways in the center of long shafts. No chuck is required with this shaper, as the column forms one side of a chuck, with jaws any desired depth, by lowering the table and using dogs and screw points and clamping against it.

The tool is always cutting at the same speed whether on long or short work, not varying speed at all points of travel, as is the case with crank movements. The screw gives the tool a regular smooth cutting speed, producing the finest kind of a surface on all metals. Water cuts on iron or steel can be taken, and as good results obtained as water turning can be done on a lathe. The stroke of machine can be altered while machine is running and readily adjusted; it will take, cut and reverse in 1½ inches, and very short cuts can be taken. The belt runs at high speed with positive cams operating the belt shifters, enabling the machine to work up to a line either way. All bearings are self-oiling and are bushed with bronze, and all loose pulleys are self-oiling with bronze bushing. Manufactured by Pedrick & Ayer, Philadelphia.

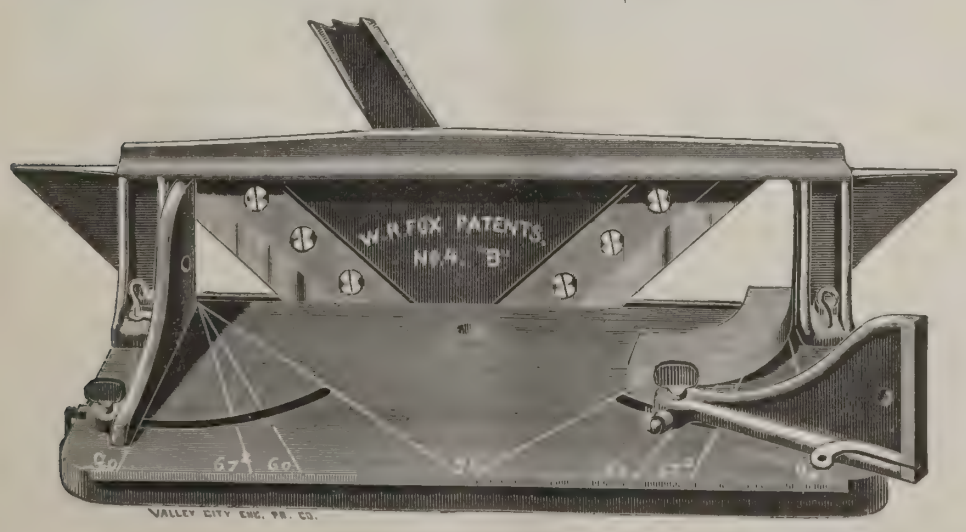
Dixon's crayon pencils, for editorial, railroad, express and telegraph offices, are an American product, a credit to Amercan workmanship, and cost less than imported pencils, which are rapidly disappearing from the desks of American consumers.

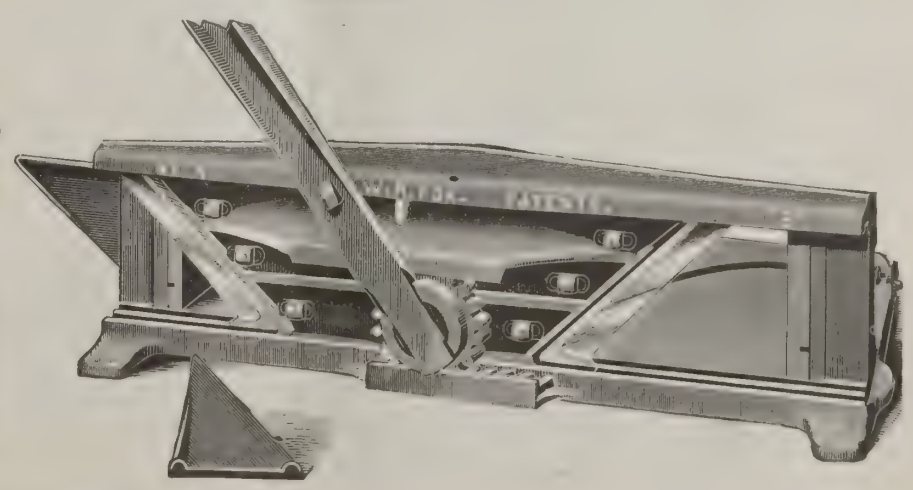


NO. 4 PLAIN MILLING MACHINE.



STANDARD SHAPER.





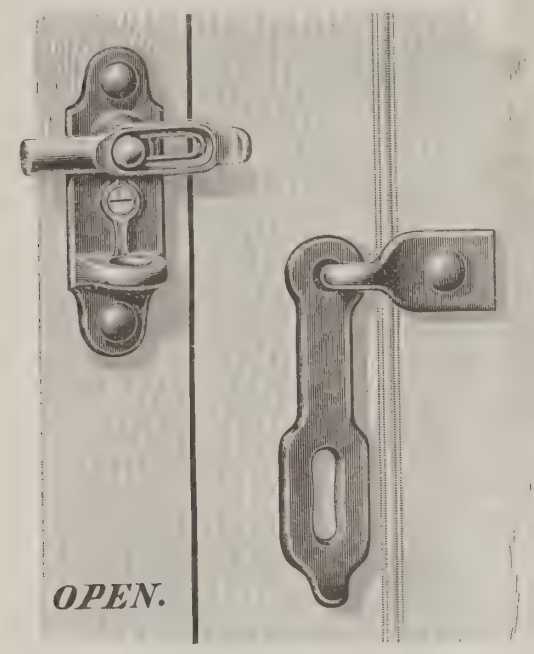
FOX UNIVERSAL TRIMMER.

New Car Door Fastener.

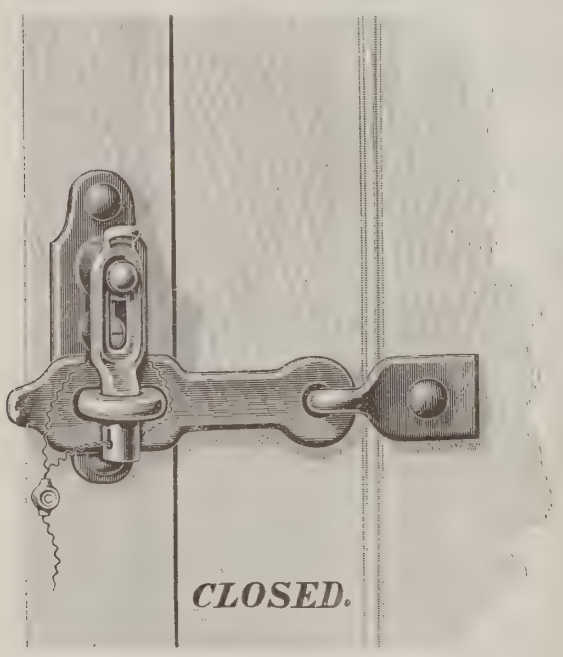
The device herewith illustrated is manufactured by the National Malleable Castings Company.

The feature of this device is the fastening of the pin to the staple plate. These pieces go out for application as one piece.

The riveting of pin to the plate is a most secure method for retaining it; it practically overcomes the most common and serious annoyance of the loss of the pin.



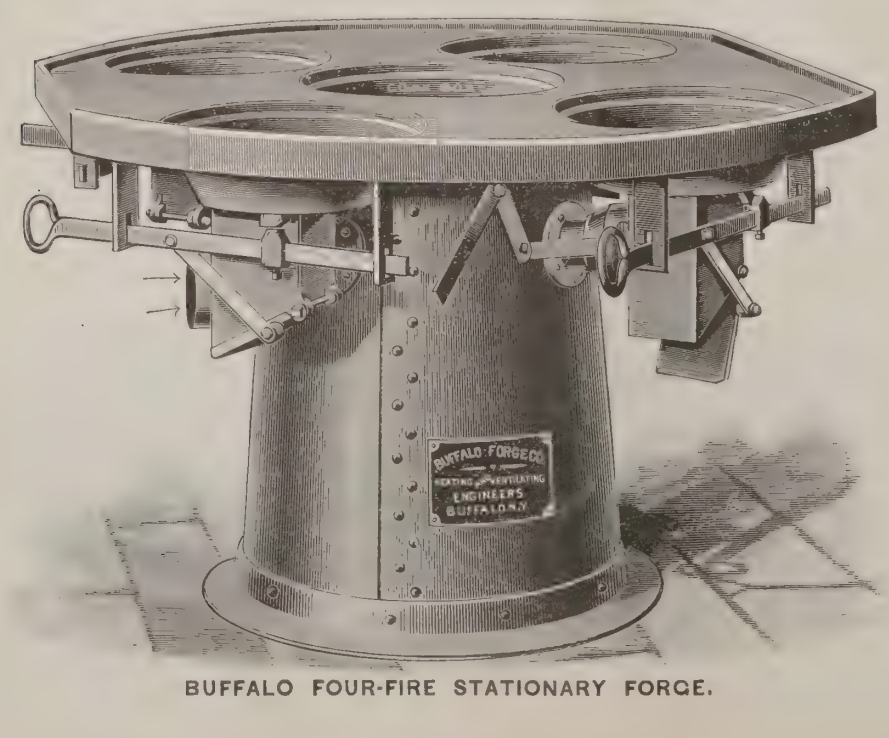
The dimensions of parts, including the size of bolts and the distance between bolt holes, are preserved, so the new device will answer for repairs to the "Standard Car Door Fastener" made by this company. This gives the added advantage that application of the improved fastening may be made to old equipment by substitution of the new in place of old parts.



This fastener in each form is complete in three parts; there are no chains, staples nor separate pins to purchase and supply.

The Buffalo Four-Fire Stationary Forge.

The modern technical and training school can hardly consider its smith shop fully equipped without a forge outfit, which does not consist of a lot of brick forges occupying considerable space, but of improved designs of iron forges especially adapted to the situation. Very few students or graduates from these institutions will need to be told that in all of the leading and most of the smaller mechanical colleges, not only throughout America, but foreign countries as well, "Buffalo" forges, exhaust fans for removing the smoke, and blowers for blast are used. The Buffalo forges are made by the Buffalo Forge Company, Buffalo, N. Y., who have from time to time gotten out numerous special forms to best suit the equipping of various blacksmith shops. These have been designed for large manufacturing concerns where extra heavy work is handled, and also for experimental shops requiring lighter machines. The accompanying engraving shows a forge especially designed for the Texas State College. It will be observed that four students can operate conveniently upon the forge at the same time. Considerable trouble and delay is caused with the old style forge when it becomes necessary to clean the fire. The live coals must be removed before the ash and clinkers can be reached; time is then lost waiting for the fire to come up. One of the latest improvements of the stationary forge consists of a patent tuyère, intended to obviate this difficulty. This is adapted to the Texas College Forge, though first designed for all the larger stationary forges for heavy work. As will be seen by the outline cut of the device here presented, the construction of the tuyère is such that all ashes, clinkers, etc., can be dropped out at the bottom, while the fire is still held in position undisturbed. Before adopting this device to any great extent it was thoroughly tested in the various shops for a wide range of work and its efficiency thus insured.

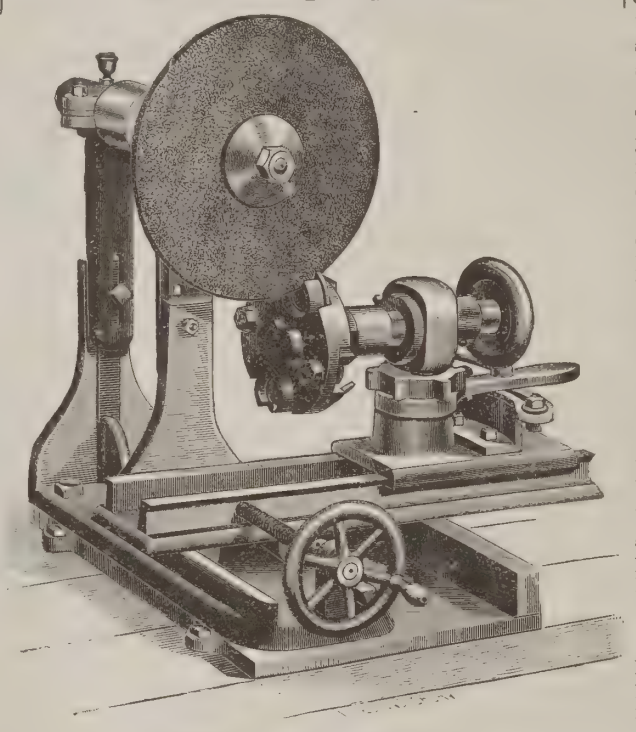


BUFFALO FOUR-FIRE STATIONARY FORGE.

Shimer Head Grinder.

With this we present an illustration of a machine made especially for grinding the bits of shimer heads or other similar work on wood-working machinery.

As will be seen from the engraving, the machine consists of a head supporting the emery wheel arbor at the top in such a manner as to be adjustable, and below this a head on which is supported an arbor to which the shimer head is secured. This arbor can be raised or lowered for adjustment by means of a thread cut on the shank, and can be turned at any desired angle and clamped. When adjusted properly it is only necessary to bring the bits one after the other into position by revolving the arbor. They are ground by moving the carriage by the hand wheel shown. This insures uniform work, and, of course, the work is very quickly done, all the difficulties met with in grinding such bits by hand being entirely done away with. The machine weighs 420 pounds, or, without the table, 200 pounds. Its height from the table to the center of the spindle is 17 inches and from the floor 45 inches. The emery wheel used is 10 inches × ⅜ inch. There is a countershaft with T. and L. pulleys, for a 3-inch belt, and it should run at a speed of 370 revolutions, giving the wheel a speed of 1,900 revolutions. It is made by the Springfield Emery Wheel Manufacturing Company, Bridgeport, Conn.



SHIMER HEAD GRINDER.

Notice.

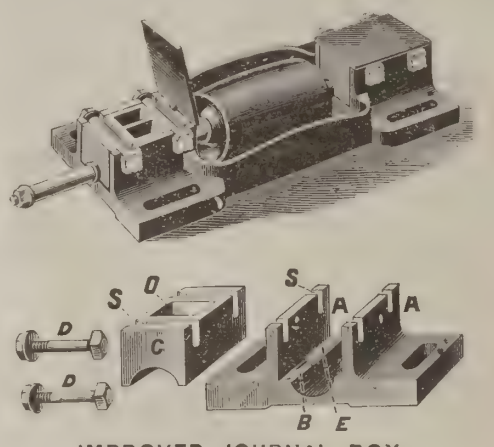
We beg to advise you that the reports in the papers of the fire at our works on Jan. 26 are very much exaggerated. Our loss is only partial; the main portion of our works have not suffered, and manufacturing will go on as usual. Any orders with which we may be favored will be filled promptly.

Respectfully,
Borne, Scrymser & Co.

Improved Journal Box.

The above cut illustrates a recent improvement in journal boxes, for the purpose of facilitating proper adjustment and providing for a more perfect and continuous lubrication than is practical in journal boxes as ordinarily made.

The Franklin Institute of Philadelphia has recently awarded the Longstreth Silver Medal of merit for this invention.



IMPROVED JOURNAL BOX.

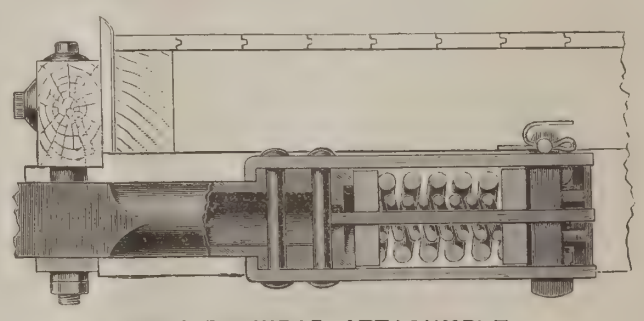
Briefly stated, the improvements consist in making the walls *A A* of the casting to extend up to the height of the top of the cap box *C*. These walls being planed through longitudinally the cap is neatly fitted between them. To secure the upper or cap box, instead of using bolts or screws to draw it down in the direction of the shaft, it is clamped in position by bolts *D D*, laid in grooves *S*, cut transversely to the axis of the shaft across the top of the cap and through the side walls. By tightening these bolts the walls are drawn together, clamping the cap box firmly between them. A large oil chamber *D*, is provided in the upper cap. The packing of paper or wood usually found in the ordinary journal box, is entirely dispensed with here, thus leaving room for a strip of wicking *E*, one edge of which comes in contact with the shaft for lubrication, and the other edge connects with an oil well *B*. Channels are provided in the casting for carrying any excess of oil back to the well. Letters patent have recently been granted to Joseph J. White, President of the Pennsylvania Machine Company, Limited, Philadelphia, for this improvement, and manufacturers of machinery may acquire the right to use it by the payment of a small royalty.

The Philadelphia *Public Ledger* Almanac for 1892 has been issued. It is a neat little book, gilt edged, full of information. It contains a chronology of the important general and local events of the last year, a list of the officers of the National Government, including members of both Houses of Congress and the heads of diplomatic service. The *Ledger* is a popular and well-known publication, and is to be congratulated upon the issue of such an interesting work.

At the meeting of the Hinson Drawbar Attachment Company, held Wednesday, Jan. 13, Mr. J. A. Hinson was elected president in the place of Lutellus Smith, and P. M. Reagan re-elected secretary, with permanent offices at 506 The Rookery, Chicago.

This firm manufactures one of the best drawbar attachments on the market. Since Mr. Hinson has given his personal attention to the management of the company, which has been within the last three months, the company has placed orders for over 2,100 cars.

The mechanical arrangement of the device in its peculiar construction of a check plate or draft lug cast in one piece, can be used with a yoke or strap which is expressly designed for the purpose. It will be noticed by the accompanying drawing that the yoke is made in two pieces, with a large key in the rear, secured by a small bolt and a spring cotter, thus doing away with the use of any nuts whatever in the yoke and attachment proper, so it is readily seen that there is no chance of losing any pieces of the device.

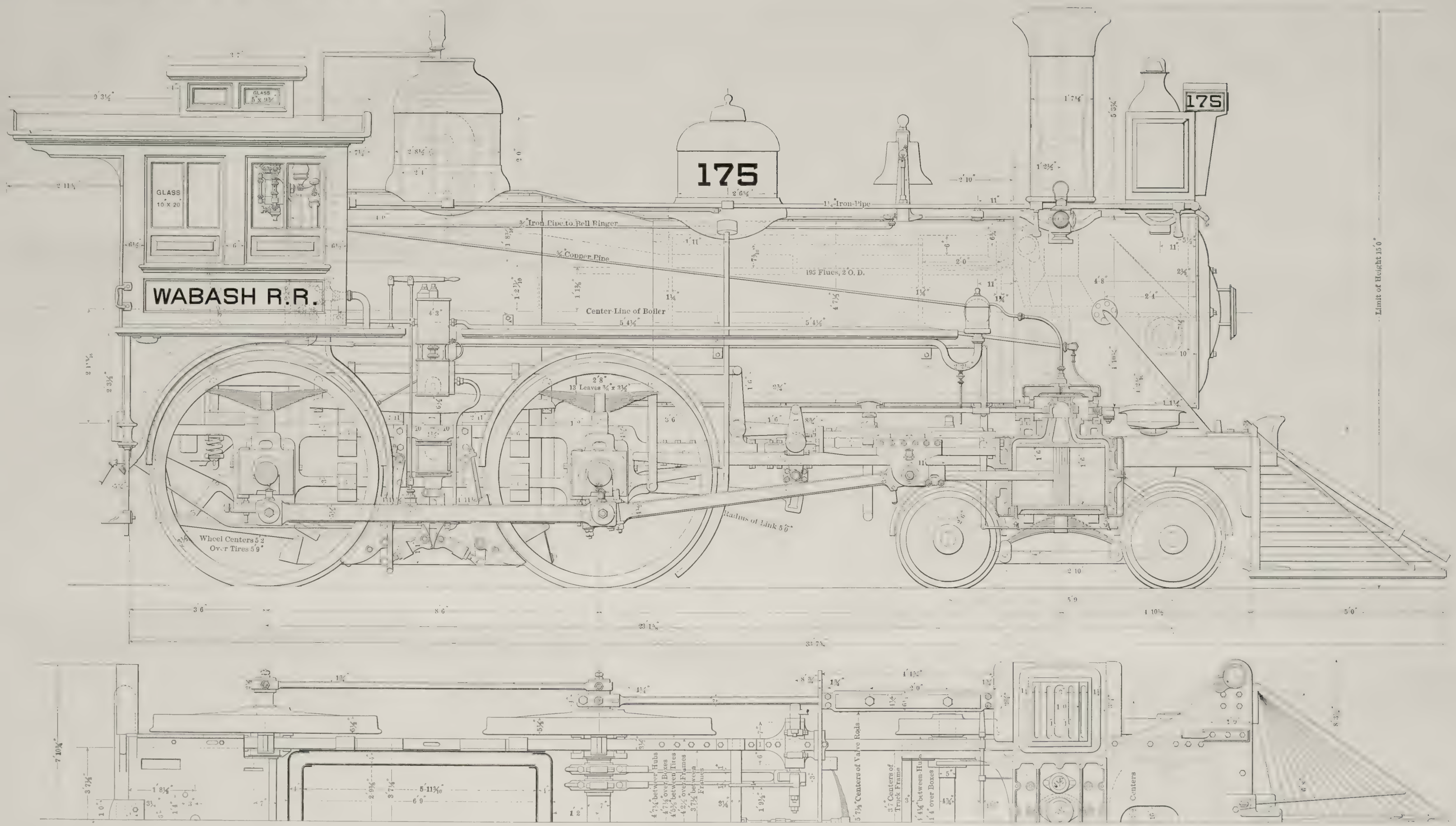


HINSON DRAWBAR ATTACHMENT.

Regarding strength, by actual tests on machine, as are made for the trade, it shows an increased strength of 33 per cent., and it is so constructed that the maintenance of attachment is only 10 per cent. of the old forms. Another point in favor of the improved yoke is in case of removal of a broken drawbar or spring the change can be made within two or three minutes' time.

Byram & Co., exclusive manufacturers of the well known Colliau Cupola Furnace, report receipt of orders from the three extremes of our Union, viz.: Greenville, Tex., Waltham, Mass., and Wallace, Idaho.

Four hundred railway lines have agreed to return exhibits to the World's Fair free of charge, and the governments of Russia and Germany have decided to haul such exhibits on all government roads at half rates.



WABASH RAILROAD CLASS "F" ENGINE.

January 30, 1892.

Designed by Mr. J. B. Barnes, Superintendent of Motive Power, Springfield, Ill.

NATIONAL CAR AND LOCOMOTIVE BUILDER

APRIL, 1892.

CONTENTS.

The Pennsylvania people are building 15 new postal cars.

The official railroad reports for January, 1892, show a large increase of earnings.

The Thomson-Houston Company is building an electric locomotive designed to develop 500 horse power.

Car stoves are prohibited on railways in the State of Ohio by a bill which has just passed the Legislature of that State.

The Wisconsin Central has begun the use of a boiler purge of the same composition as that adopted by the C., M. & St. P.

The Chicago Union Elevated Railroad Company, with a capital stock of $17,000,000, was incorporated March 16 at Springfield, Ill.

The Atchison, Topeka & Santa Fe has arranged to double-track its line between Chicago and Joliet, a distance of 41 miles.

The Argentine Republic will this year produce 400,000 bales of wool, valued at $40,000,000, the greatest clip ever known in that country.

Changes in the time tables of the Southern Pacific Railway have been made which shorten the time between New Orleans and San Francisco 12 hours.

Ebony is said to be so abundant in some parts of the State of Tamaulipas, Mexico, that it is used as fuel by the people and the Monteroy & Mexican Gulf Railway.

A collision occurred on the San Francisco & Recife Railroad, in the State of Pernambuco, Brazil, on Feb. 23, in which 50 persons are reported to have been killed.

The receiver of the South Atlantic & Ohio road has been discharged, and the road has been placed in the hands of its owners after prolonged and aggravating litigation.

The Grand Rapids & Indiana have ordered seven passenger and 16 freight locomotives of the Baldwin Locomotive Works. The new engines will be delivered in May.

The New York Central has adopted plans for the construction of an office building on its Forty-second street property in New York, adjoining the Lincoln National Bank.

The depot and general offices of the New York, New Haven & Hartford Railroad, in New Haven, Conn., were destroyed by fire recently. The loss is estimated at $150,000.

The St. Charles Car Company are building 500 box cars for the Peavy Elevator Company, and 100 coal cars for the Cairo Short Line, and 500 box and 200 flat cars for the A., T. & S. F.

Plans and specifications have been prepared and contract given out for the erection of new shops at North Paterson, N. J., for the New York, Susquehanna & Western Railroad.

The Buffalo Car Manufacturing Company is working on a large order for box cars for the West Shore, which are being equipped with the Gould car coupler and the Westinghouse air brake.

The transfer of the Atchison, Topeka & Santa Fe property in Chicago to the Chicago Elevated Terminal Railroad Company has been formally recorded, the consideration being $8,102,264.62.

The New York Central & Hudson River Railroad Company has just ordered from the Schenectady Locomotive Works 100 new freight engines to meet the requirements of its increasing traffic.

The shop of the Savannah, Florida & Western, at Savannah, Ga., was partially wrecked on the morning of Feb. 29 by the explosion of its boiler, killing four men, and destroying many valuable patterns.

The Brooks Locomotive Works are building eight 10-wheel freight engines for the Toledo & Ohio Central. They will each weigh 120,000 pounds loaded. Four are to be delivered in August and four in September.

It is said that the largest gold ingot ever shipped from the Pacific coast is that recently forwarded to the East from the Harqua Hola mine in Arizona. It weighs 349½ pounds avoirdupois, and is valued at $89,500.

The Chesapeake & Ohio Railroad has decided to renew its contract with the Pullman Company for five years. Under the new contract the company will receive twelve new Pullman cars of the latest design.

Five hundred additional freight cars have been ordered from the Sacramento workshops of the Southern Pacific Company to handle the big fruit and other shipments which it is believed will have to be moved this year.

A French officer has submitted to the War Ministry a rifle that will project a stream of vitriol for a distance of 70 meters. He proposes that this weapon be used only against savages to prevent their making frenzied rushes.

The Texas & Pacific is reducing its forces as much as possible, the endeavor being to cut down expenses 10 per cent. A number of men have been discharged from the shops of the Erie road at Port Jervis, at Buffalo and elsewhere.

On the Baltimore & Ohio recently the fireman of a freight train was shot and killed by a brakeman while the train was on the road. It is said that the brakeman was a new man who had been angered by the teasing of his fellow employés.

The Trans-Andine Railroad is so nearly completed that a gap of only 88 kilometers remains between the present termini, and the entire distance between Buenos Ayres and Valparaiso, amounting to 882 miles, can now be traversed in 72 hours.

A project for a grand central depot for all the railroads centering in Buenos Ayres has assumed a definite shape. The President of the National Railroad Board at a recent meeting with the managers of the several roads, decided to have plans drawn up at once.

The Cooke Locomotive Works are building eight locomotives for the Louisville and Nashville. The Baldwin Locomotive Works are engaged upon an order for fifty engines for the Missouri Pacific. Luckens steel for boiler plates is called for in both these orders.

Gregory Haney, an employé of the Pittsburgh, Cincinnati, Chicago & St. Louis, who died recently at Wheeling Junction, W. Va., after 28 years' service, had been laid off 20 times because of broken limbs or other injuries, and finally died of lockjaw resulting from a broken leg.

Damages suits for sums aggregating $170,000 have been brought in Michigan against the Flint & Pere Marquette road on account of the fatalities attending the rear end collision between the Lake Shore and Flint & Pere Marquette trains near the Toledo tunnel last November.

One of the most remarkable railroads in the world is the Cloggintz & Lounering, near Vienna. It is only 25 miles in length, but cost $9,000,000. It begins at an elevation of 1,400 feet and has its terminus at 13,000 feet. It has 15 double viaducts, 17 tunnels and crosses itself nine times.

The Wabash Railroad have placed with the St. Charles Car Company an order for 8 elegant 64-foot first class coaches, 8 smoking cars, same dimensions, 6-wheel truck, smoking room and all the latest improvements for comfort of patrons, mahogany finish; also 8 of their standard baggage cars.

Articles of incorporation of the Chicago, Altamont & Paducah Railway Company have been filed. The company proposes to construct a railway from Altamont, Effingham County, Ill., to Paducah, Ky. The principal business office is to be at East St. Louis. The capital stock is $5,000,000.

An attempt was made to wreck the westbound New York, Pennsylvania & Ohio passenger train, near Akron, O., on the night of March 1, a lot of logs being placed on the tracks. The engineer saw the obstruction in time to save the train, although the engine was ditched. Nobody was injured.

A new kind of porcelain has recently been made in Paris in the following manner: Asbestos is ground to a fine powder, freed from oxide of iron by means of sulphuric or hydrochloric acid, then made into a paste, molded and dried. It is then baked for 17 or 18 hours at a temperature of 1200° Centigrade.

The Wabash Railroad has placed an order for 37 locomotives with the Rhode Island Locomotive Works. They are to be 13 six-wheel connected switch, 12 ten-wheel freight, and 12 of Mr. J. B. Barnes' new design eight-wheel class F. engine, for heavy passenger service. A number of these engines are to be assigned to the Detroit & Chicago line, which is now in course of construction.

The demand for platinum for use in science has raised its value to three-quarters that of gold. Three years ago it was worth $80 a pound. It now costs $160, or 11 times more than silver. It is found in small quantities in Peru, Colombia, Brazil, the Ural Mountains, California, Oregon and Borneo The yearly output has never been more than four tons and is now three.

The initial trip of the Chicago & Alton's new fast train between Chicago and St. Louis was made March 21. It is called the "St. Louis Limited" going south and the "Chicago Limited" going north. It is scheduled to leave Chicago every day, except Sunday, at 11 A. M. and to arrive in St. Louis at 7:30 P. M. Returning, it leaves St. Louis at 8:30 A. M., arriving at Chicago at 4 P. M.

The Illinois Central Railway has placed with the Rogers Locomotive Works an order for 42 locomotives. These engines will all be made with the Belpaire type of boiler. Fifteen engines will be of the consolidation type, having cylinders 21 × 24 inches; three will be 18 × 24-inch eight wheel passenger engines, and the remaining 24 engines will be moguls having cylinders 19 × 26 inches.

During the year 1891 the Pennsylvania Railroad Company has expended for construction, equipment and real estate nearly seven and one-half million dollars. More than 39,000 tons of steel rails and about $1,500,000 ties helped to swell the account. President Roberts says from $6,000,000 to $7,000,000 will be required for additional motive power and equipment and double track this year.

A locomotive model about one-eighth size has been constructed by Stephen Paganhardt, a mechanic living at Piedmont, on the B. & O. road. It is said to have every detail complete and operative that is used on a full sized locomotive. Even the injectors will operate under steam pressure. It has an operative steam gauge, whistle, safety valve, air brake, air pump, etc. It will be exhibited at the World's Fair.

Another bill was introduced in the United States Senate March 14 to compel railroads to equip their cars with automatic couplers within a certain time. It provides that the standard coupler shall be decided by a letter ballot of all the railroads, sent to the Interstate Commerce Commission by July next. The votes shall be based upon the number of freight cars owned by each line. If the roads fail to establish a standard type then the type shall be the Master Car Builders' standard.

Plans for the station of the Chicago Elevated Terminal Railway Company are nearly completed. The estimated cost of the structure is $3,500,000. The main building will be 350 feet on State Street, 289 feet on Twelfth Street, 10 stories high, surmounted by a corner tower 60 feet square and 420 feet high. South of this structure will be a trainshed stretching 1,000 feet along State Street. It is expected that work will be begun about April 1.

Seven men were recently killed by an accident in the yards of the C. M. & St. P. Ry. at Milwaukee. A fast passenger train was running into the city parallel and on the next track to a train of box cars loaded with employés on their way home from the shops, when it ran into an open switch and crashed into the shop train, throwing three cars of the latter from the track. The men killed were all shop hands.

Under the McKinley law, all materials imported and manufactured into complete articles for export are subject to only one per cent. of the duties. The Pullman Palace Car Company imported a large amount of French plate glass, haircloth and upholstering for use in building palace cars to be shipped to Europe and Australia. The company has made application for rebates on the duties, and the facts being proved the company will receive from $250 to $400 rebate on each car sent abroad.

The annual report of the Railroad and Warehouse Commission of Illinois shows the length of main line and branches, side-tracks, etc., in the State to be 14,317 miles. Of these, 10,179 miles are main lines and branches. The capital of the railroads doing business in Illinois is as follows: Capital stock, $875,259,833; bonds, $1,001,799,157; current liabilities, $69,605,160; total, $1,946,663,770; capital stock per mile, $24,575; funded debt per mile, $27,831; current liabilities per mile road, $1,977; total, $54,383. The figures show an increase in the total railway capital as compared with last year of $177,042,906.

Description of Wabash Railroad, Class "F" Engine.

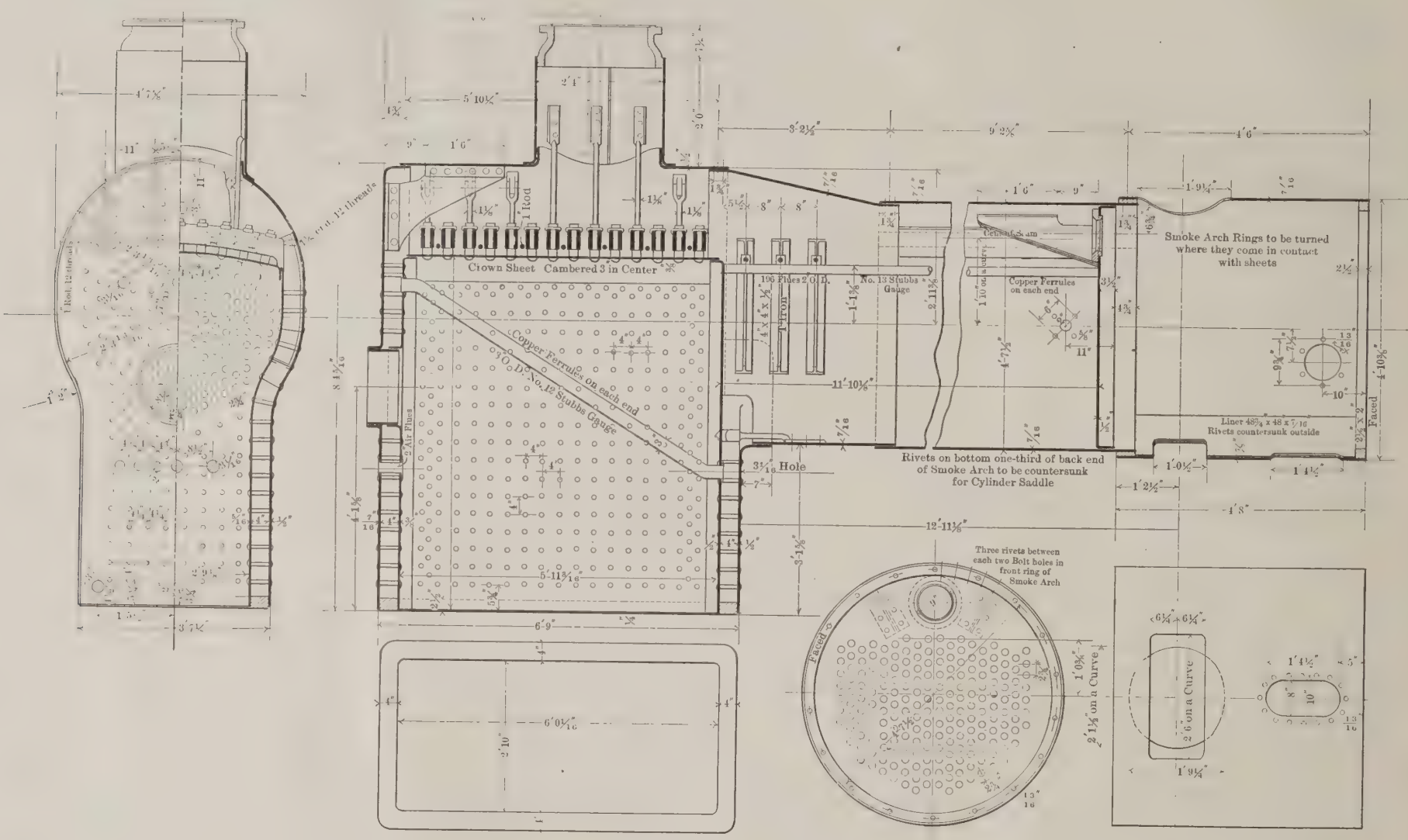
[WITH INSET.]

The Wabash locomotive illustrated with inset in this issue has numerous interesting points, which are worthy of careful study. It was designed by Mr. J. B. Barnes, Supt. M. P. and M. of the Wabash Railroad, to fill the requirements of that road and is of very recent design, the drawings being not completed until Jan. 30, 1892. The boiler is of the crown bar wagon top type, and is shown in detail by the accompanying engravings. It is designed to carry a working pressure of 170 pounds per square inch, and is equipped with the Barnes' Feed Water Purifier and Cleaning Device and the Barnes' Smoke Preventer. It will be seen that the shell is in one continuous piece, as is also the side and wagon top sheets. The purifier, which is not shown, consists of a engines are remarkably free from any jolting or side motion.

The guides are of the Laird type and made of fine close grained cost iron. The top guides are 3 inches deep and 6¼ inches wide. The bottom guides are 2⅛ inches deep and 4¾ inches wide. The cross-heads are of Eureka cast steel, with a brass gib bolted between flanges. This gib is cored out to receive babbitt and the results are very satisfactory. The back end of piston rod is straight for cross-head fit and held by clamp bolts and a ⅞ × 2½-inch key; the forward end is turned taper and ground into piston head, and held by a 2-inch brass nut 1⅛ inches thick. This arrangement gives the full strength attainable and prevents any breaking of piston rods at shoulder or through keyway. The guide yoke is a plain slab of hammered iron 1¼ inches thick and 8 inches wide. The rocker arms are of cast steel with a shaft 4 inches diameter and 13

DIMENSIONS.

Total weight in working order	99,000 lbs.
Weight on drivers	65,000 "
Weight on truck	34,000 "
Driving wheel base	8 ft. 6 in.
Total wheel base	23 ft. 1⅝ "
Diameter of driving wheel centers	5 ft. 2 "
" of " axle journals	7¼ "
" of crank pin in wheels	4¾ "
" and stroke of piston	18 in. × 24 "
Size of steam ports	1¼ in. × 1ft. 4 "
Size of exhaust ports	3 in. × 1 ft. 4 "
Outside lap of valves	7/8 "
Inside lap of valves	1/32 "
Travel of valves	5½ "
Exhaust nozzles	(double) 3⅜ "
Diameter of boiler	4 ft. 7½ "
Number and diameter of flues	196 (O. D.) 2 "
Length of flues	11 ft. 10¼ "
Length of firebox, inside	5f. 11⅝ "
Width " "	2 ft. 9⅜ "
Depth " at center	6 ft. 7¼ "
Grate area	16.5 sq. ft.
Heating surface of firebox	147 " "
Heating " " flues	1,219 " "



WABASH RAILROAD, CLASS "F" ENGINE—BOILER.

$\frac{3}{16}$-inch sheet placed inside, and extending the full length of the shell, the top edge of sheet extending 6 inches above crown sheet. The supply of feed water is forced into the space between purifier sheet and shell boiler, and it has proved that a large percentage of the impurities are separated and retained in this space, from which they are discharged through the blow-off valve in bottom of shell.

The smoke preventing device consists of a perforated stack base through which a cone of steam is formed in the stack at its smallest part, and the introduction of air currents in the firebox by steam jets. These appliances have proved successful in solving the smoke problem satisfactorily to the Chicago authorities. Double nozzles are used, and with a 3⅜-inch opening make steam freely under all conditions.

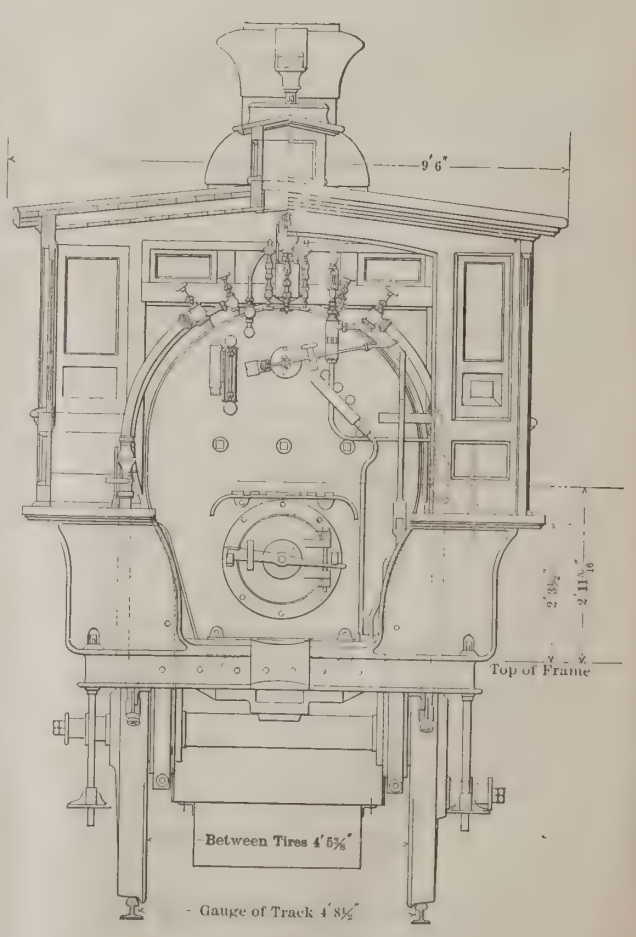
Blow off valves are placed in each side of water leg of firebox, and under the shell, and are all arranged to operate by handles from the running boards.

The total heating surface is 1,366 square feet. Otis steel is used in all parts of the boiler and firebox. Feed water is supplied by two No. 8 Monitor lifting injectors, old style, placed in cab, and overflow arranged so that no leaks will occur in the cab. The cylinders are heavy and well proportioned, all steam passages are large, with no abrupt curves or angles. They are fitted with Barnes balance valves. The ports are 1½ by 16 inches, the exhaust port being 3 by 16 inches. The valves travel 5½ inches at full stroke, and have $\frac{7}{32}$-inch outside and $\frac{1}{32}$-inch inside lap, and are given $\frac{1}{16}$-inch lead in full gear. The frames are particularly well designed, with a view to placing the metal where it would do the most good. The manner of making the splice between front and back sections recommends itself for durability and cheapness. The back frames are slotted for the equalizer hangers and back spring hangers, and the back spring hangers are cushioned by coil springs, as shown. The whole spring and equalizing arrangements are held by gibs, no bolts whatever being used, and the inches long. The links are 3 inches wide with long blocks and ample bearing surfaces to the several connections. The main rods are designed with a view to facilitate the adjustment of brasses at roundhouse points and are also of great strength without looking cumbersome. The side rods have solid ends with brass bushings, the bushings have a flange ring fitted on outside which gives a greater area of end bearing than the usual practice.

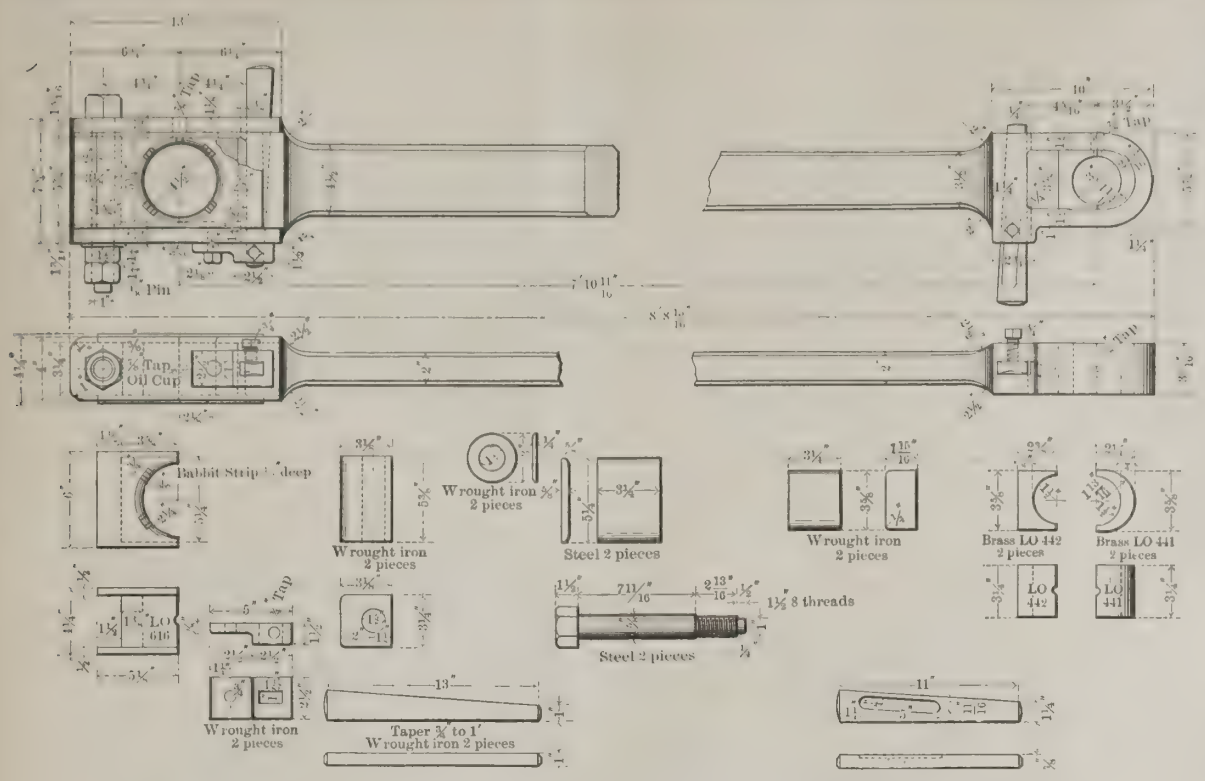
The engine truck has a rigid center of cast iron. The sides of truck boxes and pedestal jaws are chilled, the only machine work being the planing of frame pieces and center plate, and the drilling of holes. The driving boxes are of cast iron with round top brass, the saddle is partly formed by top of box. No trouble with broken flanges or saddles has been experienced with this form of box.

The engine is equipped with the Westinghouse automatic train and driver brake and signaling apparatus, and Gollmar bell ringer, operated by air. The cab is roomy and well ventilated by the clear story shown in the inset, the windows of which are adjustable. The interior arrangement of cab fittings, valves and handles is neat and convenient, and the comfort of the crew has been carefully looked after.

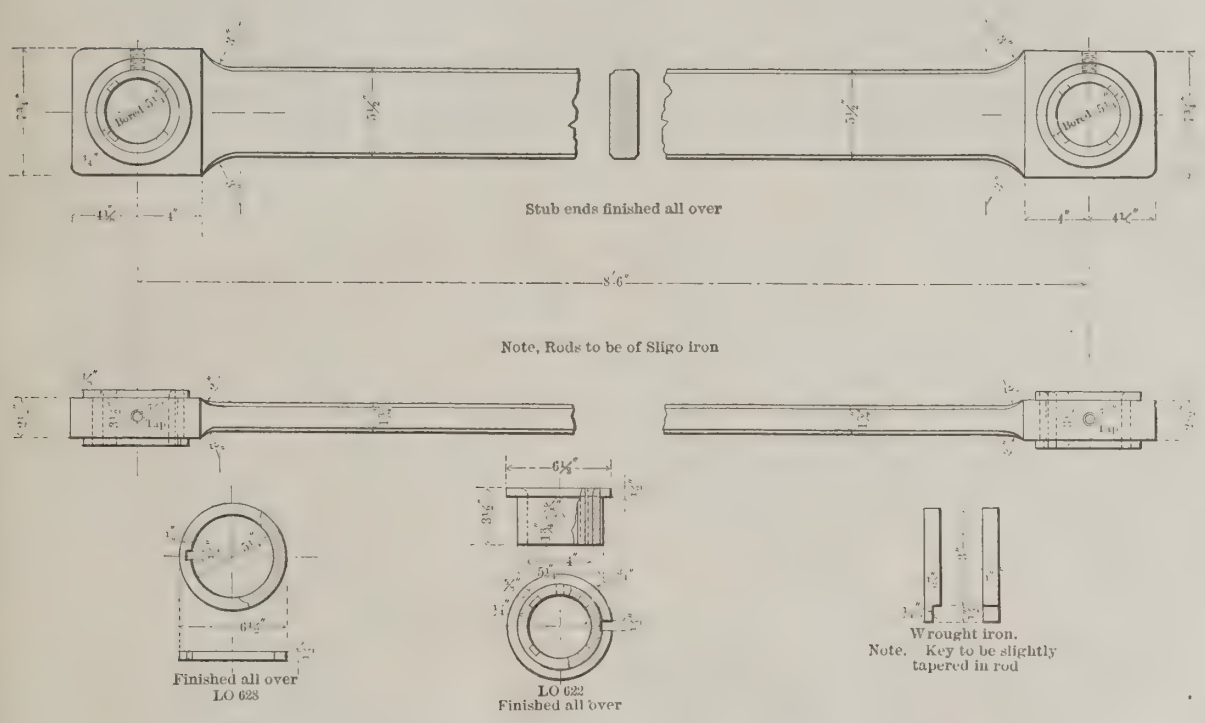
The engine is painted black, and varnished. The edges of tires are painted a steel blue. Very few finished parts are shown, as the idea has been to finish in the paint shop wherever possible without detracting from the general appearance and utility of the machine. Mr. Barnes may justly be proud of this locomotive, which shows such careful study of problems of economy of maintenance, economy of fuel and comfort and convenience of operating. The drawings comprise 157 sheets, bound in book form, which shows how careful each detail has been worked out. Three of these engines have been turned out of the company's shops and six more are under construction there, while 12 are being built by the Rhode Island Locomotive Works.



BACK END VIEW.



MAIN ROD DETAILS—WABASH RAILROAD, CLASS "F" ENGINE.



SIDE ROD DETAILS—WABASH RAILROAD, CLASS "F" ENGINE.

New Shops of the Toledo, St. Louis & Kansas City R. R.

The machinery is being placed in the new shops of the Toledo, St. Louis & Kansas City R. R. at Frankfort, Ind. These shops will be used as the general repair and car building shops of the company and will be in running order in a few weeks.

The main shops are partitioned off within two rectangular buildings, between which is a space 80 feet wide for traversing tables.

The building for engine repairs is 318 × 50 feet and the other for car repairs is 232 × 80 feet. The first building consists of boiler and engine room 25 × 50 ft. The boiler and blacksmith's shop is next and is 120 × 50 feet. Then the machine shop 100 × 50 feet, and the erecting shop 73 × 50 feet with four pits in it. The boiler is of the return tubular pattern 66 inches diameter by 18 feet long, with 54 four-inch tubes. The engine is a Watertown automatic cut-off with cylinders 18 inches by 28 inches. In the boiler and blacksmith shop are double shears and punch with 30 inch throats; a boiler plate bending machine with eight feet rollers, and a 2,000 pound steam hammer, besides the usual smith's forges and hand working tools.

The following tools are in the machine shop: One 54 in. × 54 in. planer, one 26 in. × 26 in. planer, one radial drilling machine with 6-ft. arm, three upright back gear drilling machines, one 16-in. slotter, one 16-in. shaper, one lathe 36 in. × 14 ft., one lathe 22 in. × 10 ft., three small lathes 14 in. × 6 ft., two bolt cutters and one four-spindle nut tapper. There will also be a 79-in. wheel lathe, and one axle lathe to be added to the tools already in place. Bench vises and the usual hand tools are ready for placing.

All the shops are lofty, and the numerous windows create a splendid light in every direction. The building for the car department consists of a wood-working machine shop, 60 ft. × 80 ft., and a repair shop, 172 ft. × 80 ft.

In the wood-working shop there are thirteen of the most improved machines for doing car work, and are now being placed in working order. The shafting throughout is of bright finished steel.

The engine roundhouse and building for stores and offices are all near at hand, and the whole present a compact and well arranged set of buildings. The whole plant will be operated under the supervision of Mr. John Ortton, Superintendent of Machinery and Rolling Stock, who has moved his headquarters from Delphos, O., to Frankfort.

A machine gun was recently tested at New Haven, Conn., by the Winchester Repeating Arms Company, which fired 900 shots in one minute. The only gun approaching this rapidity of firing is the Maxim machine gun, with a record of 750 shots per minute. The new Winchester gun has a water-jacket surrounding the barrel, holding one gallon of water. This amount of water is evaporated in one minute when the gun is in operation. In experiments made without the water jacket the barrel would become too hot for safety in less than half a minute.

The rolling stock equipment of the New York & New England road has been taxed to its utmost capacity during the past year to handle the heavy traffic. Considerable expenditures were made for repairs and renewals, and an imperative necessity is felt for further additions to the equipment. Four new locomotives were purchased during the year at a cost of $38,222; fifty-five locomotives were overhauled and one rebuilt, and ordinary repairs made to 91 others; 1,962 freight cars received general repairs, 38 were rebuilt, and 10,280 received light repairs.

The Pennsylvania Railroad has ordered from the Baldwin Locomotive Works a 10-wheel passenger engine, compounded on the Vauclain system; from the Schenectady Works a passenger engine compounded on the Pitkin system, and from the same works a simple engine with 19 × 24 cylinders and 6½-feet drivers, weighing about 123,000 pounds. All of these engines are ordered for purposes of investigation and comparison. The Baldwin compound No. 82 (Master Mechanics' Association engine) has been running on the Pennsylvania Railroad for several weeks past.

Strength of "Boxed" or "Turpentine" Timber.

Mention was made in our issue of December last of a series of proposed tests of the strength and properties of timber, to be conducted by the Forestry Division of the United States Department of Agriculture.

Through the kindness of Mr. B. C. Fernow, Chief of the Forestry Division, we have received information of tests conducted to determine the effect which the practice of gathering resinous matter for the manufacture of turpentine, etc., from the long leaf pine of the South may have upon the strength of the timber of the trees subjected to this practice. The gathering of the resin is done by cutting a recess (box) into the foot of the tree and then scarring the trunk above the box. From this scar the semi-liquid resin exudes and drains into the box. This process is continued for four years and then the trees, lessening in yield, are abandoned. The current belief has been that the timber of these "boxed" trees is deteriorated by the process.

As far as durability is concerned there seems little doubt that the withdrawal of the resinous matter, which furnishes protection against the penetration of water, and seems also to have antiseptic properties, reduces the capacity of the timber to withstand rot. But the tests conducted by Prof. J. B. Johnson at St. Louis lead to the conclusion that "boxed" or "turpentine" timber seems to possess greater strength than timber from unboxed trees. The following table gives a summary of the results of the tests:

COMPARATIVE STRENGTH OF "BOXED" AND "UNBOXED" LONG-LEAF PINE.

	Specific gravity.	Per cent. of moisture.	Tensile strength.	Compressive strength endwise.	Cross-breaking strength.	Compressive strength across grain.	Shearing strength.
		Per cent.	Lbs. per sq. in.	Lbs. per sq. in.	Lbs. per sq. in.	Lbs. per sq. in.	Lbs. per sq. in.
"Boxed" Timber:							
Mean of 115 tests.....	.760	30.9	15,985	5,118	8,988	743	539
Corrected for 20% moisture.....	.696	20.0	15,485	6,935	11,118	1,122	636
"Unboxed" Timber:							
Mean of 133 tests.....	.710	20.0	16,429	5,661	9,333	855	652
Excess of "boxed" over "unboxed" timber.....	—.014	0.0	—.944	+1,274	+1,785	+267	—16

It having been established as a law that strength changes with the amount of seasoning, it became necessary to establish the ratio of change due to seasoning in the boxed timber (which had been tested green), by special tests on 25 sticks taken from corresponding positions in the tree which were seasoned. Then the tests on all the green sticks were corrected for 20 per cent. moisture, corresponding to the moisture percentage of the unboxed timber.

The possibility of flaws in experiments of this kind makes it proper to caution against full acceptance of the results until further verified. Especially is it desirable to extend the investigations into the higher portions of the tree, for while no deterioration seems to take place near the scar of the tree, perhaps because the resinous juices are drained in that direction, it is possible that the wood of the higher portions of the tree may be changed, either for worse or for better.

Railway Journalists.

The St. Louis *Globe-Democrat* in announcing the meeting of the editors of nine railway employés' papers that took place there recently says: "It is the first time in the history of the country that railway editors are aiming at organization for self protection. The greed of monopoly has been very unkind to them, and their efforts in behalf of the various organizations they represent have subjected them to annoyance and inconvenience by the railway officials of the country. These men now in secret session at the Southern will not adjourn until they have effected a permanent organization that will protect itself against monopoly, and insist upon defending the interests of the workingmen. It is but natural for them to organize under the name of a fraternal circle, but their object is different."

"The following named gentlemen have come for the purpose of organizing under the banner of self protection: W P. Daniels, *The Railway Conductor;* Dan. B. Honin, *Railway News Reporter;* D. L. Case, *Trainmen's Journal;* John A. Hall, *Switchmen's Journal;* Chas. W. Martin, *National Federationist;* L. W. Rogers, *Age of Labor;* John A. Hill, *Locomotive Engineering;* S. Kellher, *Carmen's Journal;* E. V. Debs, *Firemen's Magazine.*"

The "American Association of Draftsmen" has been organized, with headquarters at Starr Mansion, Camden, N. J. The objects in view are to improve the professional ability of draftsmen, scientifically and technically, and to establish a directory of draftsmen, with certified records of their experience and special adaptability to different classes of drafting and designing, thereby enabling employers at any time to secure the assistance of the best draftsmen for their special requirements. The association will be a purely professional one. The objects of the society are certainly very worthy ones, and it is anticipated that it will contribute much to the science and practice of engineering.

Arbitration Committee's Decision.

At the meeting of the Arbitration Committee of the M. C. B. Association, held in Chicago, Feb. 9, disputes referred under the Rules of Interchange of Cars were considered. Messrs. F. D. Cassanave, M. M. Martin and John Mackenzie were present. Messrs. G. W. Rhodes and J. W. Marden were absent, but subsequently concurred in the following decisions.

A defect card reading "One Janney drawbar gone, Hinson in place" was issued by the Cincinnati, New Orleans & Texas Pacific road for a Chesapeake & Ohio car delivered to the Newport News & Mississippi Valley road. The carding road objected to paying for replacement of the drawbar on the ground that the rules allow any automatic coupler of the M. C. B. type to be used in replacing one of another make. The car was stenciled "Janney coupler," and the receiving road claimed that the owner would not accept the car from them with any M. C. B. coupler but a Janney.

The Arbitration Committee decided that one M. C. B. standard drawbar may be substituted for another of that type; and that, if none of the other parts or attachments are different from those originally used on the car, the same must be accepted by the owner. If any of the parts, such as rear end attachments or unlocking devices, are different from those originally used, the party making use of such wrong parts, when changing the drawbar, is responsible for the cost of changing the parts back to the original construction.

Nelson Morris & Co. rendered a bill with a charge of 10 per cent. against the Indiana, Illinois & Iowa R. R. for repairs to a Morris refrigerator car upon a defect card issued by the railroad Aug. 26, 1891, for one damaged draft timber.

The railroad objected on the ground that the revised rules of 1891, taking effect Sept. 1, do not allow the charge of 10 per cent.

The Committee decided that the revised rule was not retroactive, and that the obligation incurred by the I., I. & I. on Aug. 26 was subject to the charge of 10 per cent.

A car belonging to the Jacksonville & Southeastern was received by the owner from the Nashville, Chattanooga & St. Louis with 32 boards and 4 feet of tin gone off the roof, and a defect card from the N. C. & St. L. stating the damage. When bill for repairs was presented to the road issuing the defect card, it was objected to on the ground of faulty construction, old age and decay of the roof, and the ignorance of the inspector giving the card. The J. & S. E. denied that the roof was in bad condition, and claimed that the damage was done maliciously or accidentally, as the nails which secured the roof still remained in place, and the balance of the roof was in perfect condition.

Decision: The road that issued the defect card must pay for the repairs.

The Little Rock & Memphis objected to payment of a bill rendered by the Street's Western Stable Car Line for repairs to a Street Stable car upon a defect card issued by the L. R. & M. calling for "odd company drawbar."

The L. R. & M. states that the car was delivered to it at Memphis by the L. & N. with wrong drawbar, and when they offered it to the Cotton Belt Route the inspector of the latter road noticed the wrong material, and requested a defect card covering the same. This was furnished by the L. R. & M. to expedite the movement of the car, which was loaded with stock, with the expectation of receiving the car back at that point, at which time bar would have been removed.

The committee, in its decision, reminds the L. R. & M. that it had an opportunity to protect itself in accordance with the rules, by requiring the road from which it accepted the car to furnish a defect card, which would have relieved it from responsibility and protected the car owner. The bill, as rendered, was decided to be in accordance with the rules.

The Southern Pacific rendered a bill against the Texas Pacific for repairs to a number of cars upon defect cards issued by the joint inspector at Fort Worth against the Texas Pacific. The bill is disputed by the latter road so far as it concerns defect cards given on account of an M., L. & T. car for wrong drawbars which were removed by the S. P. Co., and of removal of drawbar from a G., H. & S. A. car, and to charge for repairs to a T. & N. O. car.

In regard to the S. P. Co. changing the drawbar on the two foreign cars, the committee decided that as the changes were not made on the ground of safety (the cars having been accepted and moved over the company's lines) it cannot bill against the Texas Pacific for the change, as no railroad company is justified in changing drawbars carded by other roads if the car is not the property of the road making the change.

In reference to the defects carded on the T. & N. O. car, it appears that the car was received from the S. P. Co. by the Texas Pacific loaded with stone, and was moved over the line and offered to the M. K. & T., but the latter road would not accept it unless carded for the part in bad order. The joint inspector found that owing to the lack of facilities the load could not be transferred, and the car being safe to run he furnished a defect card placing the responsibility upon the Texas Pacific. The card read, "One side sill, one end sill, intermediate sill and decking all decayed."

Upon the return of the car to the S. P. Co., the repairs to the parts named were made, and bill rendered against the Texas Pacific. The latter objected to the bill, on the ground that the defects carded for were not, under the rules, proper charges, and that the joint inspector should not have furnished a defect card. The replies of the S. P. Co. to these objections do not dispute that the parts named were decayed, but it insists that the card having been given, it is a proper voucher for repairs, regardless of the nature of the defects.

The committee's decision is that the Texas Pacific did not avail itself of the privilege to require a defect card for the existing defects of the car before receiving it, and its failure to do this made it liable for such defects to any other road refusing to accept the car without the protection of a defect card. In deciding that the rules require the Texas Pacific to pay for the repairs to the parts of this car carded by it, the committee says: "If this committee were at liberty to decide this case on the grounds of justice and equity, it would be bound to decide that no road could honestly require another to pay for its worn-out cars, when such wear and tear is, as is shown in this case, due to decay, but the committee must base its decision upon the Rules of Interchange."

The Toledo, Ann Arbor & North Michigan delivered a C. & M. W. car to the Cincinnati, Hamilton & Dayton with a defect card which read: "One broken drawbar pocket, four broken carry iron bolts." The C., H. & D. had no facilities at the point where the repairs were made to cut the broken wrought iron pocket from the bar and apply a new pocket, and its inspector put in a new drawbar to facilitate the movement of the car. Thereupon the C., H. & D. renders a bill against the T., A. A. & N. M. for replacing drawbar. The committee decides that the last-named road may properly refuse to pay for more than the cost of repairing the parts carded by it. The drawbar being sound, it is not equitable that the C. H. & D., through lack of facilities to repair cars, should extend repairs to parts not damaged. Knowing its lack of facilities for repair at the point where the car was received, it could have protected itself and the delivering road from loss by refusing the car until put in a safe and proper condition by the delivering road.

A Louisville Southern car was delivered to the Nashville, Chattanooga & St. Louis by the East Tennessee, Virginia & Georgia road with a defect card calling for "one drawbar knuckle gone." A bill of $4 for a steel knuckle applied by the receiving road (having no malleable knuckles in stock) was objected to by the delivering road, on the ground that the car, being originally equipped with a malleable knuckle, it should have been repaired with one of the same material, costing but $2.25, instead of $4 as charged.

Decision: The company carding the car was at liberty to renew the knuckle itself with another of the material originally used, instead of carding for a missing knuckle. In substituting a steel for a malleable iron knuckle the charge should be the current market price without freight charges.

The body of a Street's Stable car was destroyed by fire on the Richmond & Danville, and the owner made a net claim for $327.35. The railroad, in objecting to the bill, claimed that according to the rules, the value of the car body when new was but $275 plus the amount allowed for feeding and watering attachments — $50 — made $325, which, when properly depreciated, would leave a total of $279.81 as the value of the body of the car when destroyed.

The owner claimed that the bill was based on the exact cost of the car body, as the car was intended for the special purpose of carrying live stock, and had such special features as false sides and gates; and that the settlement should be made under the rule that refrigerator and other cars designed for special purposes shall be settled for at present cost price.

It was decided that the feeding and watering attachments of these cars are properly covered by rule No. 23, and that the gates mentioned were not expensive enough to justify a settlement on the basis of refrigerator and other special cars, and, therefore, the objection of the Richmond & Danville to the claims of the owner were sustained.

The Seaboard & Roanoke issued a defect card for a Norfolk & Western car, stating that the damage consisted of one truck spring broken, one center casting broken, one truck bolster broken, and one set of truss rods missing. It objected to paying for the replacements of the broken bolster and spring, claiming that replacements of truck bolsters and springs when not damaged by derailment or wreck are chargeable to car owners.

The committee assumed that the damage was due to rough handling or to the absence of the lost truss rods, and that the loss of same was undoubtedly due to improper inspection by the road handling the car. Therefore the S. & R. should pay for the damage stated on its defect card.

An inspector of the Nashville, Chattanooga & St. Louis road gave a defect card for an odd brake-head and shoe that were on a Kansas City, Fort Scott & Memphis car when received from a foreign road. The owner's bill was disputed by the carding company on the grounds that a foreign road applied the brake-head and shoe, probably to replace those on the car worn out, and that its inspector was in error. It was decided that the road carding the car for the wrong parts is responsible to the owner. The failure of a railroad to so conduct its inspection of foreign cars as to require defect cards for wrong material applied to the same, is liable to the owner.

The Boston & Albany Railroad Company rendered a bill against the Western New York & Pennsylvania Company for replacing brake-heads and brake shoes lost. The Western New York & Pennsylvania road objected, claiming that charges of this kind are not allowed by rule No. 8. The decision was that the only charge that can be made against the car owner under rule 8 is for brake shoes worn out, and charges for brake-heads and shoes lost are not consistent.

Ice Locomotives.

Some years ago a man built a machine at Fishkill Landing, on the Hudson River, for traveling over the ice. All the machinery attached to it was of ponderous character, so that when the locomotive was completed it weighed five or six tons. It was placed on the ice at Fishkill Landing to test its speed. The steam was turned on, but the cogs which were to force the boat along instead of doing so dug down into the ice and almost let the mass of iron and wood through. After the invention had cost many hundreds of dollars, it had to be abandoned.

Lately, a New York boiler inspector built a locomotive for navigating the Hudson on the ice. It is about 6 feet long, with a cab attached, and the highest part of the machine is not over 3 feet. The boiler head is supplied with a throttle lever, steam gauge, reverse lever and steam cocks, like an ordinary locomotive.

Under the center of the boiler, connected with the cylinder by rods, are two cogwheels, 15 inches in diameter, and under each end of the machine are two steel runners each a foot long, and fashioned like ice-yacht runners. The cogs are expected to dig into the ice, and when steam is applied, thus move the machine along over the ice on the runners at a rate of speed not yet estimated by the inventor.

The cab is not large enough for a person to get inside, but the machine is intended to draw a small platform car behind on runners, and from this car the throttle inside the cab and the reverse lever can be handled. The engine weighs 1,000 pounds. After waiting for a couple of weeks for the ice to get thick enough to make a trial trip, the engine was fired up recently and intrusted to that tricky, slippery thing—the ice. After considerable balking and the display of an evident desire to get back on solid ground, it finally got away from the man in charge and started for the shore. The men ran after it but could not catch it, and coming to a weak spot it broke through the ice and sank.

The Coming Coupler.

The Pittsburgh *Post* publishes the following as a verbatim reproduction of a letter recently received by a railroad manager from a coupler manufacturer:

"Dear Sir—ef you please will take time & give my car coupling a thought you Cant help but see my coupler is the best that is out at this time. you Can couple a hie Car & alow Car to gether, it will couple on a Curv, this Coupler Can all be made Short & the modle works like a charme. i think you give this a thought you wood See through my Coupler & See just how it works. you Say it was best, now ef you please look at it & give it a Study a fue minets and i think you See very quick that is the Coupler you want on Cars it cant help save you in hands a year $25000 dolars year. i look at hook coupling you sed was on you Cars & my Car Coupling beet that as far as nite and day dos beat nite. please read this carfley and give my coupler a tryl. dont through Side down But give it to other men to look at. i Sell Cheap i give you all Chance to try it: it not cost you anything to try tell you air Sadisfy rite ef you want to try it."

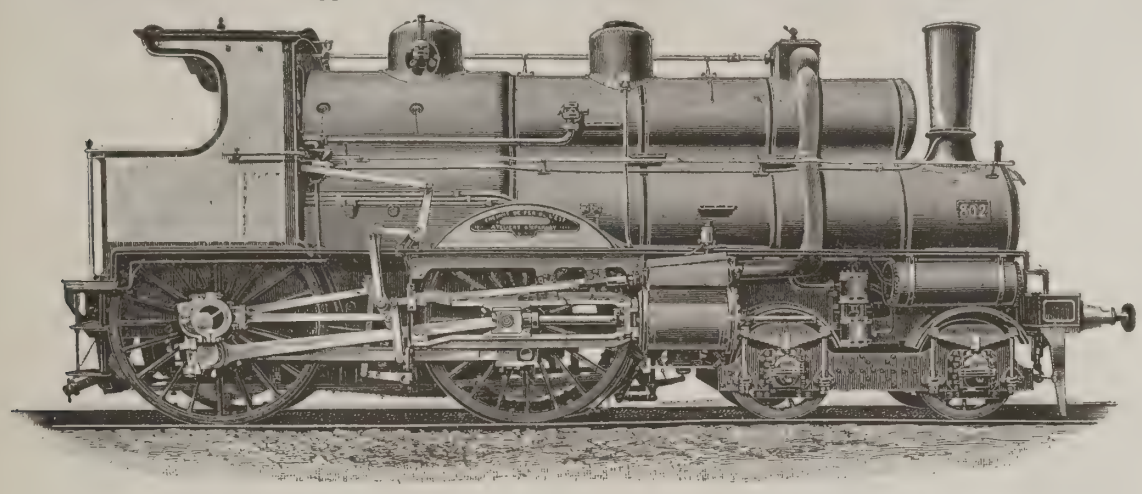
Large Space at the World's Fair.

The World's Columbian Exposition at Chicago will have one Cincinnati industry represented on a magnificent scale, viz., that of woodworking machinery. The Egan Company, of Cincinnati, O., has made application for 20,000 square feet of floor surface to display some 40 different machines of their construction and origin. This is characteristic of this energetic company, and the mechanics of the world and those interested in machinery will have a good opportunity to see the very latest results of American ingenuity for the working of wood in actual operation. Machinery for railways and car builders will be the most prominent feature.

Cornelius Hanlon, an engineer on the Philadelphia & Reading, was stricken with paralysis recently while in charge of his engine. He had been in the employ of the Reading Company thirty-five years. He was a heavy man, weighing 250 pounds, and in falling he became wedged between the reverse lever and the boiler, and it took nearly an hour to extricate him. His right hand and leg, and all his right side, were badly burned.

New Design of Locomotive, Eastern Railroad of France.

The Eastern Railroad of France has constructed at its shops in Epernay 12 express locomotives of a new type. During certain seasons of the year the train load becomes very heavy on this road, and in order to make the schedule time two locomotives are at such times required on the section between Chaumont and Belfort, and also between Troyes and Chaumont during unfavorable weather. In order to avoid running double headers M. Salomon. Chief Engineer of Rolling Stock, and M. Flaman, Designing Engineer, have designed special locomotives for this service. Their leading features are a bogie truck, outside cylinders placed unusually far back, and a boiler in two parts, one above the other. The boiler design comprises a main barrel 47½ inches in diameter, completely filled with tubes, and a secondary cylinder, 31½ inches in diameter, above this and connected with it by three large openings giving free communication between the upper and lower sections.



NEW DESIGN OF LOCOMOTIVE, EASTERN RAILROAD OF FRANCE.

The normal water level is intended to be carried about the center line of the upper cylinder, and when the water stands at this point the boiler contains about 217 cubic feet, leaving a space for steam of a little over 63 cubic feet. The water level can sink so that the steam space is 122½ cubic feet before it becomes necessary to add a supply, resulting, it is said, in doubling the reserve power of the boiler and giving a great advantage on steep grades. The boiler pressure of these engines is to be limited to 156 pounds per square inch, because of trouble experienced with the injectors used at higher pressure. The total wheel base of these locomotives, from the rear driver to the forward wheel of the truck, is 24.4 feet. The diameter of the cylinders is 19.68 inches, and their stroke 25.92 inches. The drivers are 6.85 feet in diameter. The weight of the empty locomotive is 110,000 pounds; when in service the weight is estimated at 123,000 pounds. The grate surface in these locomotives is nearly 26 square feet, and it is intended to use as fuel about 80 per cent. of coal "dust" and 20 per cent. of briquettes. The firebox has a mean depth of 6.3 feet and is 3.33 feet wide. A water arch of the Ten Brinck type is used. The heating surface of the firebox is 146½ square feet and that of the arch 24¼ square feet; making a total direct heating surface of nearly 171 square feet. There are 323 mild steel tubes 1.57 inches in diameter in the main barrel of the boiler, giving a heating surface of 1,769¼ square feet. This makes a total heating surface, direct and indirect, of a little over 1,940 square feet.

In recent tests of two of these engines, trains of 660 tons (of 2,000 pounds, and including weight of engine and tender) were hauled over grades of 0.8 per cent. at a speed of over 12 miles an hour; trains of 231 to 242 tons total weight hauled at an average speed of 47½ miles an hour over an undulating section of road, with grades varying from level to 0.3 per cent., and having two short grades of 0.6 per cent.; and trains of 154 tons total weight were hauled over this section at an average speed of 56 miles an hour. In designing these engines, MM. Salomon and Flaman considered the compound type, and finally decided not to adopt it, their reason being that the complications required by the additional cylinders and valves were not desirable. In this conclusion they differed from M. du Bousquet, Superintendent of Motive Power of the Northern Railroad of France, who has adopted the four-cylinder compound type for the heavy fast engines on his road.

"When I became the attorney for the Harlem Railroad 25 years ago," said Mr. Chauncey M. Depew in a recent address, "there were but 37,000 miles of railway in the United States. To-day there are 170,000. At that time the engine did not average over 35 tons; the freight car carried only 10 tons; a freight train of 20 cars was an extraordinary train for an engine to draw. To-day the engine of 100 tons draws a freight train of 50 cars of 30 tons each. Then we thought we did a good business if the freight train had say 200 tons; to-day we expect 1,000. It cost us just as much to draw the 200 then as it does the 1,000 now; but the reduction in cost has not gone to the stockholder nor the bondholder; every penny of it has been absorbed by the shipper, by the producer, by the farmer, by the people of the country, and by the employés through increase of wages."

Freight Car Roofs.*

BY J. C. BARBER.

The progress and improvement in designs and construction of freight car roofs during the past 35 years has nearly kept pace with the improvements of other parts of freight car construction; nevertheless, there is still a large field for improvement, and upon making these improvements, the predominating idea should be to have the fewest parts possible in order to effect a reduction in cost of first application and maintenance, and at the same time produce a roof which will have satisfactory wearing qualities, and afford better protection against leakages, which would reduce the enormous sums paid out annually by railroad companies for freight damaged by water getting in through defective car roofs.

On a recent trip east I made a special point while in New York of inspecting 125 empty box cars, belonging to the various lines, by walking over the roofs and examining the inside for water marks; and I also examined the same number of cars at Chicago and found the average number of roofs in these two lots of cars, sufficiently defective as to cause them to leak, was nearly 25 per cent. This was also the case with roofs on over 200 cars recently inspected at St. Paul terminals, and in nearly every case found it was plainly evident that defects were caused by faulty construction, cheap and poor lumber and other poor materials in the various parts of the roofs.

It would be seen, should we base an estimate on the above inspection, viz., that 25 per cent. (and I think the average number is much greater) of the car roofs are not proof against leaking; that our freight claim departments will continue to disburse large sums of money in liquidating claims for damaged freight on account of defective and leaky roofs.

I may add that the particular style of roofs showing indications of leaking were of the old style pattern, covered with canvas, roofing tin, and the double board roofs applied of a poor quality of lumber, and secured with nails which had with age corroded or broken off and worked up out of place sufficiently to allow the roof board to warp and admit water, while other board roofs, on account of being constructed of green or unseasoned lumber, were found with large open joints, resulting from shrinkage.

Roofs covered with roofing tin had many broken joints, while those covered with canvas had holes punched through it, and canvas on others had become decayed, evidently from chemicals in the paint, or from age.

In the early days of 10 and 12 tons capacity freight car construction, the roofs applied were usually in a circular shape, supported with carlines or rafters, which were exceedingly light, not larger than 1½ inches or 1¾ inches by 3 inches deep, extending crosswise of car from plate to plate without central support, except what was contained in the curve and material in the carlines, the covering was of narrow matched pine flooring ¾ inch thick, laid longitudinally, secured at the crossing of rafter with common cut nails, and the whole covered with canvas or roofing tin and painted. The simplicity and fewness of parts of this old style roof was a desirable feature, and if the parts used in construction had been increased in strength, and the frail outside covering improved in wearing qualities by substituting galvanized iron or steel, it would have made a much more durable and less expensive roof than several of the so-called improved roofs of to-day, but on account of its frail construction, corroded common cut nails (unlike our steel barbed nails of to-day) breaking loose and working up through the canvas covering, and the breaking of soldered joints in the tin, all of which caused leaks and continual repairs, the style of roof was almost entirely abandoned by all railroads between the years 1862 and 1866. It will be noted that this style of roof, would, with age, be seen to sag at points near the center, forming low spots sufficient to hold pools of water.

Just before this style of roof was condemned and abandoned, a roof came out, known as the "Double Board Roof." The covering of this roof consisted of a double course of clear pine, 1 × 6 strip, dressed both sides with deep water grooves on face side; this roof was very popular, and gave, when well made, applied, and kept well painted, fair satisfaction; was reasonable in first cost and convenient to repair. and this roof is still used as a standard on quite a number of roads. But owing to the constant growing scarcity of clear pine and the increase in cost, which has nearly doubled in the last few years, the double board roof has been nearly abandoned, and the well known patterns of combination roof substituted, on account of their cheapness, both in first cost and maintenance of repairs and lasting qualities, also their great insurance against leaking.

It will be remembered that when the first styles of combination wood and galvanized iron roofs were invented, they proved to be very defective, and altogether failed in construction to meet rough switching service. However, two or three patterns of these combination roofs were, later on, perfected, not only in construction, but the galvanized sheets of iron were so ingeniously shaped for conducting rain, etc., that it made the car roof comparatively waterproof, and at the same reduced the cost fully 20 per cent. less than the price of a first-class double board roof, and decreased the liability against leaking 30 per cent., as well as prolonging the life of the roof. On account of all these good features in a roof they are now used and adopted as standard on perhaps one-half of the railroads in this country.

There are two or three styles of combination wood, paper and fibre roofs recently introduced, which, in my opinion, are well worthy of consideration. Special claims are made that they are economical for use in repairs of old double board roofs; several roads are making tests of these roofs, and inspection reports of them received so far, are quite favorable.

As before stated, there is a large field for improvement in car roofs. Taking for example three or four styles of the most prominent roofs, it will be found that the average number of parts (less nails, screws, washers, etc.) aggregate 338 pieces to the car, multiplying this number by the number of box cars on some of our larger lines, say 7,000 cars, it makes the exceeding large number of 2,366,000 to be watched by our inspectors and kept in order.

It is, therefore, important that those who are inventing and bringing out new designs of roofs should greatly reduce the number of parts and improve excellency of material.

Several car builders, as well as myself, have frequently mentioned the fact that our Master Car Builders' Association has not given the question of improving car roofs proper attention, and it will be noticed that there was no committee appointed to report on this subject at the next annual convention. I believe the roof question will be a profitable one to consider, otherwise the progress in roofs will not keep pace with other parts of car construction.

*Read before the Northwest Railroad Club.

The Chicago, Burlington & Quincy people are using some large nozzles on their class "H" engines in Illinois. The engines have 19 inch by 24 inch cylinders and Belpaire boilers. The largest tip they have used on these engines was 5¼ inch diameter. This was on engine No. 3, running on trains 1 and 2 between Chicago and Galesburg. This was run for some time, but found to be a little light on the fire in cases where the engine had to be pushed unusually hard. They are now running the engine with a 5-inch tip. Engine No. 125, on trains 1 and 2 between Galesburg and Ottumwa, is running with a 4¾-inch tip. The area of these openings are 17.7 square inches for the 4¾-inch tip, and 21.6 square inches for the 5¼-inch tip. The area of the exhaust port is 71¾ inches, and of the exhaust pipe 35 inches.

This road has been experimenting for some time in the matter of reducing the diameter of stacks, and has found that in many cases, by reducing the diameter of stack from 17 inches to 16 inches, the nozzle could be enlarged from ¼ inch to ⅝ inch, with a marked reduction in fuel consumption. The height of the exhaust pipe must have a large influence on the diameter of the stack, viz., the higher the exhaust nozzle the smaller will be the diameter of the cone of steam that enters the base of stack, consequently one would not expect to use as small a stack at the base with a low nozzle as with a high nozzle.

The Atlantic Transport Company's steamer "Missouri" sailed from New York on March 15 loaded with 2,500 tons of food for the starving peasants of Russia. The corn which was sent from the Western States was ground into corn meal, and for fear that the peasants of Russia would not be familiar with the manufacture of "hoe-cakes" and "Johnny cakes," a printed slip in the Russian language was placed in every bag of cornmeal, telling the receiving peasants how to use it to the best advantage. The great bulk of the cargo, however, is flour, and this the Russian peasants can use without directions. The Atlantic Transport Company acted most generously in the matter, giving the use of the ship for the trip free of charge, and donating to the famine fund $2,500 received in payment for the transportation of cattle that existing contracts required it to forward on the Missouri.

A California big tree has been selected in Tulare County to be shown at the Exposition. A committee of the board of trade, after an extended tour of inspection, picked out a tree measuring 87 feet 9 inches in circumference at the base, 85 feet in diameter five feet above the ground, and 65 feet in diameter at a height of 16 feet.

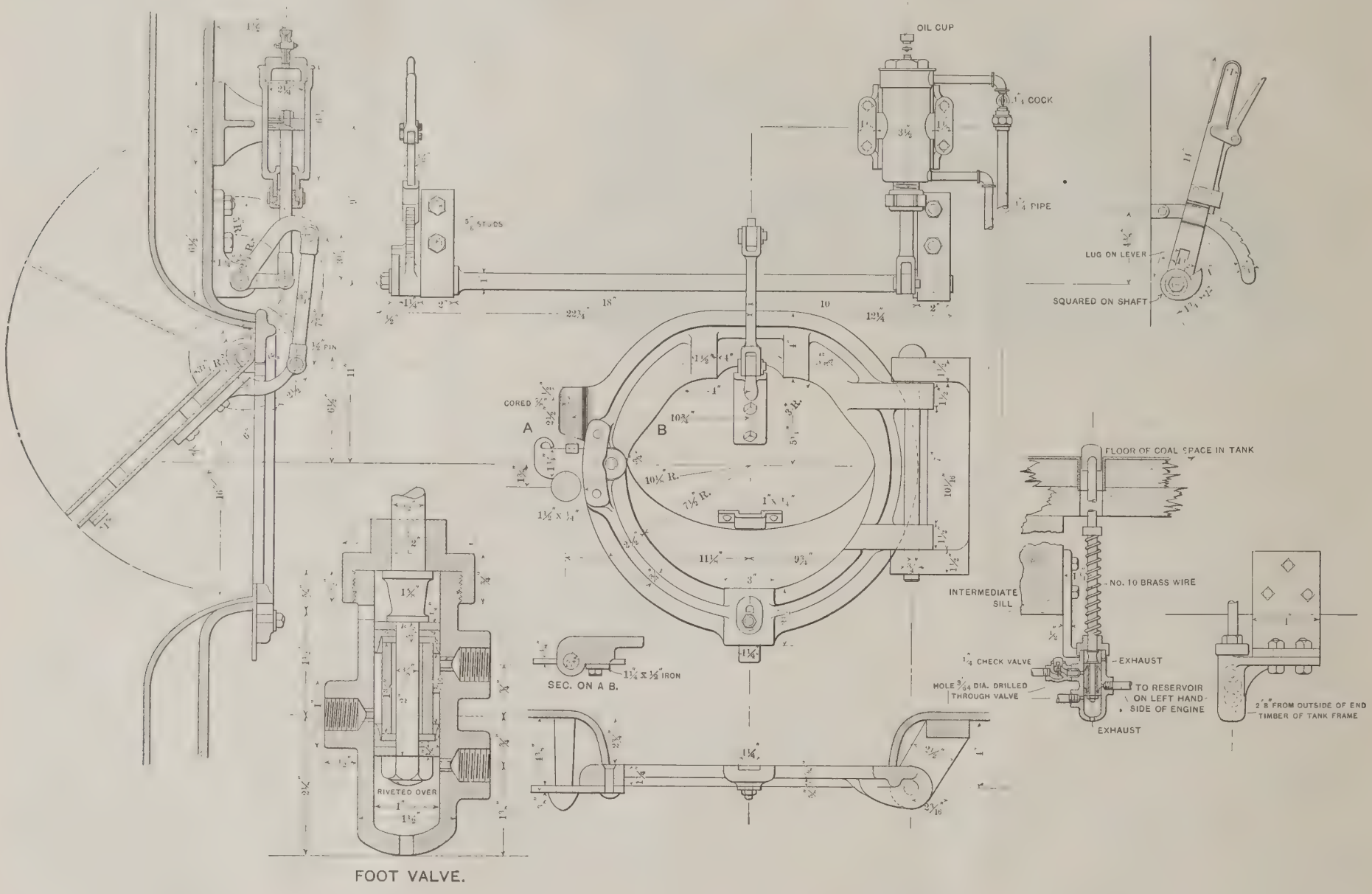
The Hawksworth Compressed Air Door Opener for Locomotive Fireboxes.

The illustration on this page of a compressed air door opener for locomotive fireboxes was designed by Mr. D. Hawksworth, Superintendent of Motive Power, Burlington & Missouri River Railroad, and is in use on the locomotives of that road. The double purpose for which it was designed is to relieve the fireman of the labor of the ordinary method of opening and closing the door between each shovelful of coal, as is customary, and at the same time save fuel and prevent injury to the flue sheet by enabling the fireman to handle the door so as to have it open a shorter time while putting in "fires;" and, as the door opens inward, it makes a deflector that directs the current of air onto the fire, instead of allowing it to make a straight shoot for the flue sheet when the door is open, as is the case with the ordinary fire-box door.

A Big "Barn Raising."

The contractors who are putting up the big steel trusses for the roof of the Manufactures Building for the Columbian Exposition are getting ready for the biggest "barn-raising" in history. There are 27 main trusses, with a span of 380 feet and a height of 211 feet. They are 14 feet wide at the floor and 10 at the apex. These trusses with the eight smaller gable trusses weigh 10,800,000 pounds. The main trusses weigh about 350,000 pounds each, and they are to be raised in position from the floor. To handle these great iron structures a "traveler" is being constructed on the floor of the building, 50 feet by 260 feet and 120 feet high. On top of this "traveler" will be raised a central tower 135 feet high, so that the total height of this great lifting arrangement is 255 feet. It will weigh 720,000 pounds, and over half a million feet of lumber will be used in its construction. The floor of the building will not, of course, bear this great weight, and the "traveler" will move on a track specially prepared for it. As much as is necessary of the floor will be torn up and three rows of piles will be driven to support the "traveler." When the work of raising the trusses is finished this piling will be sawed off and the floor relaid. Another big "traveler" is being rigged on the floor of Machinery Hall to erect the iron work in that structure—a task scarcely less difficult.

A short time ago, an unusual accident befell Mr. E. W. Risley, an engineer in Cincinnati. It being Sunday morning, Mr. Risley undertook to clean out the big boiler under his charge, and with this object he took off the manhole cover and crawled in. He had finished his work and was about to return, when it occurred to him to turn around and come out head first. He was experienced in such matters and had often turned around inside the boiler before, but this time he got caught in some manner when half-way around, and found that he could neither turn further nor return to his original position. For a quarter of an hour he struggled to free himself, and then realized that it was hopeless to try to get out without help. He shouted for assistance, but nobody heard him. His lamp went out, and he knew that by morning he would very likely be so weak that he could not call out at all, especially as his chest was pressed againt his knees so tightly that he could scarcely breathe. In the early morning the fireman would come. He would, doubtless, put on the man-hole cover without thinking to look inside, and would fill up the boiler with water, and Risley would be drowned. These thoughts did not add to the engineer's comfort, as the reader may readily imagine. Thoughts of his wife and three little children came to him, and the boiler seemed to be pressing slowly in upon him from all sides, like the famous "iron bride" of the days of torture. After nightfall, by some happy chance, the engineer unlocked his cramped limbs. How he did it he does not know. He reached the outside air half crazed, and, falling upon the ground, lay there for an hour, entirely exhausted, before he was able to go home.—*The Locomotive.*



THE HAWKSWORTH COMPRESSED AIR DOOR OPENER.

In this design the doorway is provided with two doors, one on the outside much like the ordinary door and opening outward as usual, and then the air operated door opening inward as shown in the illustration.

The inside door opener consists of a cast iron ring, hinged as an ordinary door, and on the inside of the ring is a hinged door opening inward and upward so that it acts as a deflector. In case of any trouble with the inside door it can be bolted to the outside by means of a sliding bolt shown at the bottom of the door in the illustration and held with a nut. By disconnecting the arm the door can be used with a chain as an ordinary outside door. Should the air give out the inside door can be held open at any distance by the lever working over a quadrant as shown in the illustration. The inside door is worked with a rocking shaft, which turns in bearings fastened to the head of boiler and connected to a piston working in a cylinder oscillating in a bracket, fastened above the rocking shaft on the boiler head. The piston is operated with compressed air from main reservoir admitted by means of a foot valve shown on the right and on a large scale on the left of the illustration.

The *modus operandi* is as follows: The fireman fills his scoop and at the same time presses his foot on the button in the deck. This forces the double piston of the foot valve down and air is admitted to the top of the cylinder, thus opening the door. He throws his coal into the firebox and takes his foot off the button, when the coil spring lifts the double piston, opening the top of the cylinder to the exhaust in the bottom of the valve and admitting air to the bottom of the cylinder very slowly through a small hole in the check valve placed on this connection so that the door closed by gravity, and the pressure being admitted slowly it does not slam shut. On opening the door the pressure lifts the check valve and passes freely out through the exhaust passage in top of foot valve.

A recent article in *Power* shows that condensing steam engines where water is scarce can be arranged to use the same water over and over again provided suitable provision is made for cooling. In California, where fuel economy is very important, several such plants have been recently erected. A typical one of this sort is that of the California Street Railway Company, of San Francisco. On the roof of the building is placed a series of shallow tanks or pans with a total surface area of 8,000 square feet. They are in three tiers, and the water from the circulating pump is delivered into the upper one. The pans are set with a slight inclination and the water slowly flows in a thin sheet from one pan to the next and finally reaches the supply pipe, being cooled in the meantime from an average temperature of 140 degrees F. to 80 degrees. The total consumption of water by the plant, due to loss by evaporation, leakage, etc., is said to be about half what it is with the engine working non-condensing. That evaporation is the principal cause of the shrinkage is attested by the fact that the water cools much faster in a warm windy day than in a cool and still one. The average indicated horse power of the engine is 325. The vacuum obtained is 22 to 23 inches. The oil from the engine cylinders gives some trouble, as it collects on the surface of the pans, and has to be scrubbed off about once a month. A plain mesh of wire gauze used as a strainer and placed in the last tier of pans has proved a fairly efficient device fo catching the oil. About 15,000 gallons of water or about enough for 14 hours' consumption running non-condensing is the amount required to fill the circulating apparatus. It is apparent from this that the lack of an abundant water supply need not prevent the use of a condensing engine, provided the gain by condensing is worth a little extra trouble and expense.

Engineer Henry Milligan, of the Delaware, Lackawanna & Western, was in charge of the leading engine of a double header on the morning of March 21, when a drift of snow 10 or 12 feet deep was struck with sufficient force to crush in the forward end of the cab. Milligan was crowded against the rear end and his head driven through the glass window. His feet stuck out of the hole in front, and he was so tightly wedged in that the snow had to be shovelled from the cab to get him out. He suffered a broken shoulder-blade, his head was severely cut by the broken glass of the cab window, and one leg was burned by being pinned against a steam pipe.

Strength of Car Bodies and Body Bolsters.

BY GEO. L. FOWLER.

At the request of several correspondents of the National Car and Locomotive Builder, I have made some calculations regarding the strength of the framing of the sills and body bolsters of standard cars of several railroads, the carrying capacities of which range from 40,000 pounds to 60,000 pounds. This has been done as a continuation of the article on truck bolsters in the December issue.

In the calculations no account has been taken of the strength added to the car by the upper framing, merely the sills and their truss rods having been taken into consideration. The load applied has been taken to be one that is evenly distributed over the whole floor of the car, and one which by this even distribution will throw the maximum on the allowed working stress on some part of some one of the members. It almost always occurs that while some portions of the framing are bearing all the strain which it would be safe to put upon them, others are doing but a small percentage of what they are really capable of doing. For example, while the sills and truss rods between the trucks are carrying their full load the sills outside of the body bolsters are working far below their actual capacity. This, in this instance, is, of course, as it should be, for it leaves an excess of strength in the ends of the car to withstand the shocks of train and yard service. There are, in other parts of the car, points where the total load is limited, and these, in the case of these especial calculations, limit the load of the car. As these points vary with the design of the car, and as no two occur in exactly the same place, it would occupy too much space to enter into the subject in detail. The general statement may be made, however, that the truss rods are apt to be the limiting point, and that the strength of the car can, almost invariably, be very materially increased by dropping these rods lower at the center, and there seems to be no good reason why this should not be done.

In calculating the strength of the body bolster the application of the weight upon the bolster by the sills and the truss rods has been considered. That is, the strength has been calculated upon the basis that the total ultimate or working strength is applied in portions apportional to the actual pressure that would be applied by the sills and truss rods of a uniformly loaded car.

In every instance the materials have been taken to be of follows: Sills of Georgia yellow pine; the wood as the body bolsters, oak; all truss rods and plates, iron. The strength assumed for these materials per square inch of section is:

Material.	Ultimate strength.	Working strength.
Georgia pine.....	12,500	2,500
Oak.....	12,000	3,000
Iron.....	55,000	12,000

Naturally any variation from these figures would change the results, but it is believed that the strength of the materials named is about that assigned to them.

The strength of the truss rods was determined graphically, while the formulæ for beams and girders as given in D. K. Clarke's "*Rules and Tables*" were used for determining the strength of the sills and bolsters.

The following tables give the results obtained:

TABLE OF STRENGTH OF CAR FRAMING.

Road.	Car capacity in lbs.	Kind of car.	Ultimate strength.	Working strength.	No. of sills.	No. of truss rods.
			Lbs.	Lbs.		
Old Colony.....	40,000	Box.	210,000	52,780	8	4
Baltimore & Ohio.	50,000	"	309,500	70,250	8	4
" "	60,000	Hopper bottom.	402,000	108,870	5	4
Buffalo, Rochester & Pittsburgh....	60,000	" "	628,000	118,280	6	4
East Tenn., Virginia & Georgia.	60,000	Box.	393,500	93,770	6	4
New York Central & Hudson River	60,000	"	559,900	109,290	8	4
Pennsylvania.....	60,000	"	302,800	54,460	8	4

TABLE OF STRENGTH OF BODY BOLSTERS.

Road.	Car capacity in lbs.	Kind of car.	Construction of bolster.	Ultimate strength.	Working strength.
				Lbs.	Lbs.
Old Colony.....	40,000	Box.	Iron.....	125,590	26,300
Baltimore & Ohio.....	50,000	"	Oak and iron plates trussed with two rods...	214,220	38,390
Central Vermont.....	50,000	"	Oak trussed with two rods.....	243,430	56,616
Baltimore & Ohio.....	60,000	Hopper bottom.	Oak and iron plates trussed.....	277,370	77,830
Buffalo, Rochester & Pittsburgh.....	60,000	" "	Oak trussed with four rods.....	136,460	54,016
East Tennessee, Virginia & Georgia.....	60,000	Box.	" " " two "	162,790	41,800
New York Central & Hudson River.....	60,000	"	" " " " "	171,916	35,818
Pennsylvania.....	60,000	"	Iron.....	234,500	51,200

An examination of these tables shows an even greater variation of practice than did the calculations given regarding the strength of truck bolsters in the previous paper, probably because of the greater complication of strains involved. It would seem, however, that for ordinary work the factor of safety of any of these cars would be sufficient, owing to the fact that full capacity loads are rare, and there is always a tendency to collect the load over the trucks when the capacity of the cars would be greatly increased, and it is not an uncommon thing to see a whole load within six or eight feet of the truck centers.

I would like to add that I have received a number of drawings of cars intended to be incorporated in these tables, but they did not contain sufficient data for the purpose of the calculations and have therefore been necessarily omitted.

Protect Varnished Cars.

BY CHARLES E. COPP, IN THE PAINTERS' MAGAZINE.

With the painting of railway passenger cars, done in the most lasting manner, and the most durable varnish selected to use to protect this work, there are still questions of durability that should be considered by every well managed railroad, and these are questions of conditions which will contribute to the permanence of varnish to the greatest extent when in service. That is to say, first, will the varnish on a passenger car stand the longest while running constantly in a train? or in yards and side tracks? or in car houses? And what can be done toward changing some of these conditions?

As to whether a car will stand varnished the longest in a train or standing still in a yard or side track, my opinion is that it will stand the longest in the train, for the reason that it gets the benefit of the cylinder-oil from the engine mixed with steam and distributed over the car, which coats the varnish and protects it, and keeps it from drying up.

The sun is the great destroyer of varnish, and when a car is not in use it scalds down upon it in the hot months and burns the life out of the best of varnish. With the car running, it passes through the air and keeps cool. True, there is some friction here against the air, cinders, dust, etc., but not enough to nearly offset the evil effects of the burning sun. Rain and snow are not the great enemies to varnish that they are imagined to be, but it is the everlasting and otherwise blessed sun, without which we could not live a minute.

Therefore I am an advocate of the building of cheap sheds to shelter spare cars to break off the force of old Sol's rays. Most car houses are made too tight for the best purpose of housing cars. They are almost air-tight, quite light-tight (dark as Egypt), and storm proof. Now, this is all needless. The roofs should doubless be water-tight, but I would have them light as day, and the sides made of boards with cracks left open for the free circulation of air, even to wind blowing through them. Most railway managers do not seem to think that it pays to build car houses for cars, and yet they lose enough in the wear of costly varnish, in my opinion, to build a suitable house in a few years for a train of cars, to say nothing of better looking trains. It is discouraging to the master painter to see spare cars standing by the acre on unoccupied land and dumping places, against sand banks, etc., perishing in the hot sun, when they might at least be screened from it in cheap structures. It is the dampness of closely built car houses that has been objected to so much, as rusting and swelling up a car and doing it so much permanent injury. Build them upon high and dry places and make them open enough, and all this will be avoided. Suppose the snow or rain does blow in a little; that is not what hurts the varnish.

Then again, another thing which contributes to the durability of varnish on the road is proper cleaning. More varnish is ruined with ignorant and barbarous washing on the road than perhaps in any other way. The writer lately saw a baggage master at a terminal washing the exterior of his train with boiling hot water! What else will stand the change from zero to two hundred degrees above without cracking? And yet the painter is blamed for all cracks! And then soaps and alkalis are smuggled into this service to the ruinous effect of cleaning the cars. Better have them let alone, unless they can be washed under the supervision of somebody who understands the nature of varnish and what it will stand.

Again, if it is practicable, an occasional turning (by running the train around a "Y") of the cars will equalize the wear of the varnish on such roads as run east and west, which gives one side of the train to the sun's rays continuously, which has more to do with the uneven wear of the varnish upon a car than most folks would be willing to concede on first thought. Not long since it became necessary for the writer to repaint a car, and one side of it was so much worse than the other on this account that it had to be burned off. The varnish had so perished that the paint had also loosened its hold to such an extent that repainting over it was not deemed advisable. I would admonish all railway officials in a final word to look about them and see what can be done to protect and therefore increase the durability of the varnish upon the cars of their roads.

Master Car Builders' Association.

A meeting of the committee, consisting of Messrs. G. W. Rhodes, E. B. Wall, and George Gibbs, appointed by the Master Car Builders' Association to report at the June annual convention on a standard of efficiency to which all power brakes shall be subjected before they receive the indorsement of the Association, was held at Chicago March 25, all members being present.

The following specification was prepared, and is now submitted to brake manufacturers and others interested in safety appliances, for criticism:

1. *Screws.*—Brakes will be tested on either a fifty 34-ft. car train or on a rack representing the piping of a fifty 34-ft. car train. In the latter case special effort must be made to have all cocks, angles and connections identical with those in train service. A drawing will be submitted, showing what shall constitute the proper fittings, pipe, etc., for one car, including engine connections to the pilot.

2. *Pressure.*—Tests will be made with a uniform train pipe pressure of 70 lbs.

3. *Piston Travel.*—In testing brakes the piston travel must be so adjusted that it will not be less than 5 inches or more than 7.

4. *Construction of Triplets.*—Triplets must be constructed so that they can be secured and operated on apparatus conforming to diagram, Fig. 1. (The committee will publish this diagram at a later date, or will furnish it immediately to any brake company requesting it.)

5. *Application Test, No.* 1.—Brakes must commence to apply on the fiftieth car in three seconds or less than three seconds from the moment of first application on the engine, and must indicate at least 55 pounds in the cylinder in three and a half seconds or less from the initial application.

6. *Application Test, No.* 2.—Commencing with the fifth car from the engine, the air from the cylinders of three successive cars will be cut out. The brakes will then be applied as per test No. 5, and if they fail to make the time stipulated on the fiftieth car the brake will not be considered as coming within the Association's requirements.

7. *Release Test, No.* 1.—A uniform pressure of 70 pounds having been secured in the train pipe, all the air will be exhausted from the train pipe. After a pause of ten seconds to allow the equalization of the auxiliary and cylinder pressure, the train pipe will be pumped up to a pressure of 63 pounds and the record of the condition of the brakes taken. All brakes that are found applied at this pressure will be considered as not releasing.

8. *Release Test.*—This test will be arranged the same as in No. 7, except in the release. In place of pumping the pressure off, 90 pounds will be accumulated in the main air reservoir and turned into the train pipe. After a period of 6 seconds, at which time all brakes should be released, the record will be taken as before.

9. To insure the accuracy of the measurements of time in application and release, electrical recording apparatus will be used.

The committee adjourned to meet at the Grand Pacific, Chicago, at 10 A. M., April 22, 1892, at which time representatives from the various brake companies and others interested will be invited to discuss the above tests.

The Arbitration Committee requests suggestions from members, from railway clubs, and from others interested in the rules of interchange, as to what changes they consider should be made in these rules by the association in convention next June.

It is not necessary that the specific matters taken up by the Committee on Joint Inspection as to interpretation of the rules should be mentioned in replies. Address replies before May 1 to John W. Cloud, Secretary, Rookery Building, Chicago.

The Committee on Standard Center Plates and Stake Pockets was instructed at the last convention to report at the next convention recommending a standard for stake pockets and a method for attaching to the cars, and also a standard for center plates, one for iron transoms and one for wooden transoms. In accordance with these instructions the committee has prepared drawings for two sizes of stake pockets with single "U" bolts, and two sizes with double "U" bolts; one standard of each kind for stakes 4 inches deep at the top, and the other 5 inches deep at the top—the width of all being 3½ inches at top.

The committee has thought it desirable, in recommending a standard center plate, to establish a diameter of an even number of inches at some point on the center plate, and it proposes 8 inches as the inside diameter of the truck center plate at the top, on a line 1½ inches from the inside face of the bottom of the plate.

Requests for the drawings and questions relating thereto, and all answers should be addressed to William Forsyth, Chairman, Aurora, Ill.

The Northern Pacific Railroad is pushing the work on its new line from Shehalis on the Pacific division to South Bend and Willaba Harbor, which is about 100 miles north of the Columbia River. It is expected that the line will be completed by July. This will open up another deep harbor on the Pacific Coast and one of the best timber sections in the State of Washington. It is the intention of the Northern Pacific to run steamers around South Bend to Portland and San Francisco.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

LOCOMOTIVE BOILERS OF NEW DESIGN.

The new type of locomotives used on the Eastern Railway of France, illustrated and described on another page, is of interest mainly from the unusual design of the boiler, the main barrel of which, 47 inches in diameter and completely filled with flues, is surmounted by a cylinder 31½ inches in diameter connected by suitable openings with the lower or main boiler, forming a part thereof.

It is stated that the object of the design is to afford the largest possible water space for the accumulation of a large reserve power in the shape of a great quantity of water heated to the boiling point. It being intended that the water-level shall usually be kept about the middle of the upper cylinder, there is, without encroaching unduly upon the steam space, room for storing about 60 cubic feet or 3,300 pounds of water in excess of the amount necessary to keep the heating surface covered. This permits of the injection of water to the boiler being suspended during emergencies of excessive work, as in climbing grades, until this reserve supply of water is used up, or the hardest work is over. The stored water being possessed of about one-third (28 per cent.) of the necessary heat to turn it into steam of the desired pressure, the fire is relieved of furnishing that proportion of the required heat while the injection is suspended, and this allows of forcing the engine to harder work than would otherwise be possible without reducing the boiler pressure.

This is not the first instance of locomotive boilers being designed specially to utilize the heat storing quality of water, as 20 years ago a locomotive was built in this country to run without a fire, the boiler, or reservoir, simply being filled with water heated to the temperature of ebullition under high pressure. This locomotive was used for doing light work about a manufacturing establishment, and as it went about its work the highly heated water continued to furnish steam as used, of a constantly reducing pressure, of course, until the heat it contained in excess of generating steam of 50 pounds pressure was exhausted, or until the reservoir was again replenished with hotter water. But the design of the new type of locomotive boiler on the Eastern Railway of France is the first instance we have learned of where the special object aimed at was to utilize the advantages we have often expatiated on of allowing the water level to vary to aid the engine in its work or economize in fuel, by suspending the injection of water during hard work and replenishing during easy work.

Half of the locomotive engineers in America neglect this very important point, and many act on the erroneous belief that the proper way to feed a boiler is to keep the water-level at a height above the crown sheet as nearly unvarying as possible. In running stationary engines such practice is well enough, but in running locomotives a much more wasteful practice does not exist.

It may be an open question if this particular design of boiler will be found to be safe in service and economical in repairs. It appears open to the criticism of being top heavy and at high speed on a crooked road this might prove disastrous; but we believe that the increased efficiency the boiler was designed to effect will be satisfactorily accomplished.

In our next issue we will illustrate a proposed plan for a locomotive boiler, designed by an American superintendent of motive power, that will be somewhat similar in appearance to the new French type, but intended to accomplish a widely different purpose.

ILL-FITTING BRAKE SHOES.

During the air brake tests on the Chicago, Burlingron & Quincy and the Lehigh Valley roads, in February, a noticeable feature during the early stages of the tests on both roads was the inefficiency of the brakes on the engines, due, it was reported, to the new and ill-fitting shoes with which the brakes on the engines and tenders were equipped. After some considerable service the trouble disappeared when the shoes were worn down so as to fit the wheels better.

At the last annual meeting of the Central Railway Club, Mr. P. H. Griffin spoke of the too common practice of using shoes that, through faults of patterns or casting, present, when new, only a part of their intended rubbing surface to contact with the wheels, and in thus reducing the areas of frictional contact reducing the braking power.

This is a matter that is dangerous to neglect, especially in passenger equipment. It is hardly dangerous in freight equipment because it is not likely that the brakes of a train of twenty or thirty freight cars are often equipped with enough of new shoes to seriously affect the whole train braking power. But with a passenger train of five or six cars, one or two cars, or one car and the engine equipped with new ill fitting brakeshoes, which may easily and often occur, the efficiency of the brakes as a whole would be seriously impaired and one of the conditions of disaster—poor holding brakes—be present until the new shoes were worn so as to fit the tread of the wheels. Who can tell what emergency may arise before this is done that will call for all possible means of stopping to avert disaster or mitigate its evils?

Whenever the service is such that the highest possible efficiency of brakes is required, it appears that particular attention should be given to this matter, to the end that all new shoes applied shall be free from defects of radius or casting that may prevent the contact of the entire face area with the tread of the wheels.

LOCOMOTIVE TESTS.

A good many persons interested in the economical operating of locomotives will be pleased to learn that the first series of tests to be conducted with the locomotive in the testing laboratory of Purdue University, mention of which was made in our last issue, will be to determine the effects of varying the cut-off of steam to the cylinders, with a view of ascertaining the effect on the performance of the boiler, and of adding some definite information as to the relative merits of regulating the power to be developed by locomotives by the throttle or the reverse lever.

It is eminently proper in beginning a series of experiments relating to locomotive economy that this very question of throttling steam or varying the cut-off to suit the work required should be taken up at the beginning.

As is well known, the NATIONAL CAR AND LOCOMOTIVE BUILDER has always maintained that the proper and most economical method of regulating the development of the power of locomotives to suit the varying requirements of their work, is to vary the cut-off and maintain high initial pressure in the cylinders by a full open throttle, instead of using a certain cut-off and varying the pressure of—throttling—the steam, and much has appeared in our columns supporting this position as advocating correct theory and good practice.

Those who hold contrary views generally believe that increased cylinder condensation with the shorter cut-offs neutralizes the advantage of the greater expansive use of the steam. But it should be borne in mind that the advantages of high initial pressure and short cut-off is not confined, in locomotive operating, simply to saving steam and heat in the cylinders. As the exhaust steam is used through contracted nozzles to force the draft through the fire to sufficient intensity, any reduction in the force of the exhaust steam has an immediately saving effect on the burning fuel in the firebox, carrying less unconsumed fuel to the smokebox in the shape of sparks, and giving more time for the absorption of the heat of the escaping fire gases by the water in the boiler. By changing the cut-off of steam to suit the work required and leaving the throttle full open, a softer draft on the fire is secured than if the required change in power production was effected by continuing the use of the same cut-off and opening or closing the throttle.

Throughout the proposed series of tests the conditions of load, steam pressure, speed, etc., will be kept as nearly constant as possible. The cut-off will be changed for each test, and each test will be continued several hours so that all data relating to boiler performance, as well as that obtained from the cylinders may be reliable.

We trust that those who conduct the tests will not be satisfied with the means of regulating the cut-off that the wide spaced notches of the ordinary quadrant affords, which cause a variation of about two inches in the cut-off when the reverse lever is changed from one notch to another. Such wide spaced notches necessitate a great deal of wasteful throttling on the road, and it would be very interesting to learn what effects are caused by varying the cut-off one inch or less while the engine is running cutting off between say four inches and ten inches.

WATER-GAUGE GLASSES.

On a prominent railway a proposition was recently made by one of the master mechanics to dispense with water-gauge glasses on the locomotives in order to decrease the expense of repairs. This is simply an instance, many of which we have observed, that goes to show that the water-gauge glass is not held in very high esteem by some officers in charge of locomotives. Water-gauge cocks cost about five dollars per set (top and bottom cocks), and possibly three dollars per year may be expended in maintenance for broken glasses, gaskets and grinding in, and this suggests to some that an economy would follow dispensing altogether with the water-gauge glasses and depending, as we used to do, on the old reliable gauge-cocks.

Whether the objection to water-glasses is based upon the grounds of economy, or their comparative safety in reference to gauge-cocks, it is entirely erroneous, and any railroad that would dispense with them would commit a blunder for which it would pay dearly. The payment might or might not appear very plain, but it would surely be made.

As safety is of the first importance on any railroad, the comparative safety and reliability of water-glasses and gauge cocks deserves first consideration. Among the most deceptive things we have ever had the annoyance to meet, certain forms of gauge-cocks in combination with certain forms of "drippers" are pre-eminent. So much so, indeed, that a man of ordinary intelligence and ordinary sense of hearing, and quite familiar with the ordinary difference in the sound of escaping steam and escaping water, would be quite unable to tell, without seeing, whether such cocks, when opened, emitted steam or water.

With a water-glass there is no reason but gross carelessness why any one should be deceived as to the exact water level in the boiler, who can see and who knows that boiling water under steam pressure is never absolutely still. And with a water-glass there is the additional assurance of safety that, generally, there are two men watching the water level instead of one as with gauge-cocks only.

On the score of economy the water-glass is still further in advance of gauge-cocks than in regard to safety, for, indicating as it does the exact water level in the boiler, and declaring at once an increase or decrease of the quantity of water therein, it is possible to feed the boiler to better advantage; and thereby an economy is effected of more importance than is generally supposed, and compared to which the increased cost of maintenance of the glass gauge over the gauge-cock is a mere bagatelle. If the water-gauge glass costs three dollars per year, its presence or absence may easily affect the coal consumption of the engine 500 pounds per day, aggregating some seventy tons in the year's service.

Probably one of the worst evils that the water-glass serves to correct, and that is common on engines equipped only with gauge-cocks, is "flooding" the boiler, or allowing more water to be forced in the boiler than an equivalent of what is being parted with as steam. During normal or heavy work this causes an extravagant and entirely unnecessary consumption of fuel. On a locomotive with only gauge-cocks to indicate the water level, and an engineer not particularly observant of his fireman's actions and the steaming of his engine, this occurs frequently and often lasts long enough to make a serious inroad on the coal pile—not afterward compensated for. A water-glass serves to correct this and shorten its duration by immediately declaring the presence of the surplus water.

Far from dispensing with water-gauge glasses, they need to be more widely adopted, and railroads using any of the several types of locomotives on which the engineer and fireman are separated, or on which the fireman has not a free and easy view of the water-glass, cannot spend five or six dollars for each engine to better advantage than in putting on a water-glass for the benefit of the fireman. The outlay will be repaid several times over every year by the aid the gauge will give to proper firing and saving of fuel; and then, again, there will be the additional safeguard of having two men watching the water level instead of one.

THE PENNSYLVANIA RAILROAD.

The great network of railroad lines embraced in the Pennsylvania system, connecting as it does the three largest cities of the United States, its immense traffic, many thousands of employés, and the skill with which all of its departments are operated, combine to place this road in the front rank of the great railroads of the world and make its affairs of interest to all connected with railroads. According to the annual report lately published the gross earnings of the past year exceeded $135,000,000, exceeding by over a million dollars the year's earnings of the eight principal railroads of England, and to earn this great sum 130,000,000 tons of freight and 85,934,517 passengers were carried—a third more passengers than there are people in the United States.

The highest order of ability in many branches of business and industry is required for the successful conduct of such enormous traffic. In the engineering department the skill employed in maintaining the roadbed and bridges, and in the transportation and mechanicai departments the requisite skill to handle the many trains of cars constantly kept moving over the 4.300 miles of road, and the maintenance of rolling stock, is obvious to all. But controlling and making all this possible is the financial ability which provides the ways and means for carrying on the many enormous activities and brings about at the end of the year a profit for the stockholders on the very small margin of difference between receipts and cost of a little over one-fifth of a cent per ton mile, and less than half a cent per passenger mile. Outside of the direct business of the company there are many thousands of people representing nearly every trade, profession and branch of business who depend largely upon the prosperity and activity of this great corporation.

INSTRUCTING ENGINEMEN.

In our last issue a series of articles was begun on the coal consumption of locomotives, the second number of which is crowded out of this issue by a plethora of news. The first papers deal with the matter of educating engineers and firemen in economical methods of management, and subsequent papers will deal with other matters affecting the economy of fuel consumption.

Educating the men to a proper conception of the influences that affect the consumption of fuel by the engines in their charge is a very important and yet a difficult thing to accomplish. Locomotive engineers, especially those who have run many years, do not take kindly to instruction of any kind. Of course, there are exceptions among the more intelligent, and it has been our fortune to meet many such, but it is a fact that a large majority of old runners are opposed to receiving instructions about methods of management from any one. And, generally, in proportion as their habits of using steam, feeding the boiler, etc., are viciously wrong and wasteful, so in like proportion exists antagonism to correct instructions and improved methods. This results from a belief, too largely prevalent, that having fired several years, learned the road and, finally, having reached the right-hand side, it must be quite beneath becoming dignity to receive enlightenment from any one concerning the running of their engines.

What a fatal stumbling block this same fear of lowered dignity has been to many men in railroad service, not engineers. With any man or class of men resentful of suggestions or just criticisms the way of advancement, improvement and success is seriously obstructed. Railroad officers desiring the best possible service and the greatest economy in the operating of their locomotives can afford but scant sympathy for the injured feelings of any who may be so silly as to feel offended when wasteful methods practiced are pointed out and improvement required.

As a rule firemen are more pliant than engineers, as every master mechanic knows, because they are generally young men learning to be engineers, and often eager to improve as much as possible. The commendable and growing practice of master mechanics in selecting young men possessing a good common school education for firemen is also bearing good fruit in raising the intelligence of this class of employés, and it is one of the hopeful signs of the times, giving assurance of improved intelligence of the engineers of the future, which must result not only in more intelligent and careful work, conducive alike to safety and economy, but also more satisfactory relations between employer and employé.

Instead of waiting several months or a year after a fireman has been employed before attempting to instruct him in matters pertaining to his work, allowing him in the meantime to waste fuel and be generally inefficient, we believe the matter of instructing should begin before actual employment, whenever there is opportunity to do so. There is no good reason why an applicant for the position should not be required to understand the elementary principles of combustion and that fuel economy is important before he begins firing. Before he begins he is in a better mood for study than afterward, and it is really easier for him, because the laborious duties of a fireman are very exhausting to a new man, and leave slight disposition and enfeebled capacity for study. On the other hand, a fireman starting in with a clear conception of what is wanted of him is apt to be successful and economical, if he is equal to the work and his judgment is good.

The decisions rendered by the M. C. B. Arbitration Committee at its last meeting, which are given in a revised form in another part of this paper, contain several object lessons of the folly of giving defect cards for defects that the carding road does not want to pay for, and of the importance of an intelligent conception of their duties and an intimate knowledge of the rules of interchange by inspectors. Several instances occur where inspectors have put their employers "in the hole" for damages and defects they were in no wise responsible for, and only became so through the employment of men in a position where they have authority to issue defect cards, who either lack the requisite intelligence to properly perform their duties or entertain a vague comprehension of the rules.

That a defect card must be considered as a voucher for the repairs or changes it authorizes is impressively shown in the decision of the case of the S. P. Co. vs. The Texas Pacific. Here it was undisputed that the defects named were simply those of decay, for which in all reason and justice no one but the owner was responsible; but the Texas Pacific, through the neglect of one of its inspectors, became responsible for the defects, and must pay the expense of renewing the decayed parts.

Agitation in industrial circles has again been unusually aggressive during the past month. About 350,000 coal miners in England struck and remained idle a week, and in doing so caused 200,000 men in other employments to be thrown out of work. The object of the men in stopping work was to check the output of coal to prevent the market from being glutted, and thereby to avert any possibility of a reduction of wages.

A strike of workmen in the shops of the Pennsylvania Company at Indianapolis, which began about the middle of February, was so persistent that on March 14 the company was forced to secure an injunction to restrain the strikers from interfering with its efforts to employ new men.

A convention of delegates from various unions of the machinery trades was held in Pittsburgh to organize a national federation, but it is reported that the organization was not effected.

New schedules to increase the wages of conductors and brakemen on the Atchison, Topeka and Santa Fe, and to pay for overtime to the conductors and brakemen of the Union Pacific and the Canadian Pacific have been adopted. The allowance of overtime pay on the Canadian Pacific was only gained after a strike of conductors and brakemen lasting from March 17 to 26. The questions at issue were finally referred by the company and the strikers to a committee of five locomotive engineers for arbitration, and their decision, which was of the nature of a compromise of the disputed points, was accepted by the company and the trainmen.

A pitiable object lesson of the consequences of careless flagging is the harrowing condition of Mrs. Homer Baldwin, one of the surviving victims of the terrible Christmas eve collision on the New York Central, caused by the wretched and inexcusable carelessness of Brakeman Herrick in neglecting to flag a following train.

This unfortunate woman, burned and mangled from head to feet in the wreck, has lost her scalp, ears, eyes, legs, and one hand at the wrist and the fingers of the other. She has sued the New York Central for $250,000 damages. It is said that this is the heaviest suit against a railroad to recover for personal injuries ever instituted.

Literary Notes.

South-American Railways.—Argentine and Uruguay. By J. R. Carter, F. R. S. Second Edition. 12mo. Cloth. 274 pages. Good Index. Price, 2s. 2d. Fredc. R. Mathieson & Sons, 19–22 Capthall avenue, London.

This excellent little book gives in a concise form about all the information one could wish to know about the railways of the Argentine Republic and Uruguay. The information given covers the annual reports of the different companies, capital, mileage, route, receipts, expenses, traffic, train and wagon miles, and names and addresses of all officers. Correct to November, 1891.

The Practical Brass and Iron Founders' Guide. By James Larkin. Henry Carey Baird & Co., 810 Walnut street, Philadelphia, Pa.

That the publishers have reached the fifth edition of this work within two years proves the miscellaneous information it contains that may properly be classed under its title has been of considerable interest to readers identified with the iron and brass industries. The present edition has been enlarged and improved.

Practical Carriage Building, compiled by M. T. Richardson, editor *The Blacksmith and Wheelwright.* Vol. I., illustrated, cloth, price $1. M. T. Richardson Company, publishers, New York.

This is a practical book on carriage and wagon building, containing numerous short articles on the subject that were written by men engaged in the business for the columns of *The Blacksmith and Wheelwright.* The book is therefore one devoted principally to the discussion of shop methods, tools and wood-working appliances necessary for a successful shop. It contains much of interest to carriage makers.

How to Run Engines and Boilers. By Egbert Pomeroy Watson, editor of *The Engineer.* Pages 125. Price $1.50. *The Engineer*, 150 Nassau street, New York.

This is another one of the series of excellent books written by Mr. Pomeroy in plain and simple language to give a clear conception of the causes of many influences that affect the proper and economical working of steam engines. Written principally for the advice of new beginners in the management of stationary engines, it yet contains much of interest to those in charge of all kinds of steam engines and steam users generally. While it appears that combustion of fuel and proper methods of firing might have been treated at greater length with profit to the readers of the book, considering the importance of fuel economy and the always growing objection to the smoke nuisance, nearly every other matter of steam engine management and care is covered.

A Car Coupler Fiend.

A New York drummer engaged in the peaceful pursuit of selling kid gloves has forsaken his occupation and evolved into a car coupler fiend. He might have escaped this craze had not his ingenious mind recognized the many defects of the present crude arrangements for fastening kid gloves, and therefore straightway devised a fastener compared with which all other means of fastening gloves were disastrous failures. If gloves, why not corsets? This was a question that naturally suggested itself. Applying the glove faster to corsets charmed the ladies. Nothing so nice!

If kid gloves and corsets, why not freight car doors? These need fasteners too. And if gloves, corsets and car doors—happy thought!—why not the cars themselves?—

> "Thus time brings all things, one by one, to sight;
> And skill evolves them into perfect light."

Now, the advantages to accrue from the use of a type of car coupler, with the working of which all the young men in town would be familiar (not, of course, in the form of its application to corsets, but as applied and used on their own gloves and those of their lady friends), must be apparent to railway officers. In case of strikes among train or yardmen, or need for more men, those employed would be proficient in operating the coupling device—at present the most hazardous and troublesome thing to learn about train service.

In the modest statement of the manufacturers of this device, we are told that it is so "suggestive of extreme simplicity, that the observer is led to marvel that it should have remained so long dormant in the brains of our scientific and mechanical genii. Probably the reason may be found in the inventor's statement that we have sought our appliances in the domain of art instead of that of nature. Still pertinent is the query, Why did this ingenious contrivance not follow immediately in the wake of old philosopher Newton, when he discovered the laws of gravitation? No newer principle than this has been discovered. The invention consists simply in the application to it of a revolving weight.

"The inventor possesses a striking personality, characteristic of the indomitable will, patience and energy which have produced such fruitfulness from an idea which, but for those traits, might have relapsed into oblivion and been again lost to the world for another century. Perhaps the most interesting facts to mechanical readers will be that the inventor is not a practical mechanic, and has never been engaged in business of a mechanical nature."

Capitalists, having discovered the mine of wealth covered by the glove-corset-car-coupler, seven corporations have been organized to work it for all it is worth "in all the commercial centers of the world. In each of these concerns the lucky inventor holds a direct interest which must, in the near future, place him far beyond the realization of even the wildest dreams of success which animated his ambitious soul when first he set foot upon the progressive and genius-developing soil of America."

Such are the roseate dreams of the car-coupler fiend. Who would disturb them?

The Litchfield car shops have orders on their books for nearly 4,000 cars.

The Baldwin Locomotive Works will begin in a few days the delivery of 40 new engines for the Baltimore & Ohio. The contract for the engines was given about three months ago, and before April it is expected that all of them will be delivered and in service.

Engine No. 385 of the Central Railroad of New Jersey broke all records of high speed on Feb. 26, by running a mile in 39¼ seconds, or at the rate of 91.7 miles per hour. The engine is a Baldwin compound. In speeding this engine the first mile was made in 76 seconds, the second in 62, the third in 53½, the fourth in 45½, and the fifth in 39¼ seconds. The engineer reports that the engine was running fastest on the sixth mile, but it was not recorded on account of excitement which followed when the engine made this wonderful speed. Mr. Hoffecker, Superintendent of Motive Power, informs us that he has every reason to believe the report correct, and that he has timed this engine himself while running a mile in 42 seconds. Four duplicates of this engine have been ordered.

In addition to the ordinary locomotive which the Purdue University at Lafayette, Ind., has adapted for the purpose of various tests, the laboratory is equipped with other apparatus for work in steam engineering, as follows: A specially fitted slide-valve engine for practice in valve setting; a Dean steam pump, with indicator rig; several steam injectors; a Barrus continuous calorimeter, and a Peabody throttling calorimeter for determining the quality of steam; apparatus for comparing thermometers, testing gauges and indicator springs, and an ample supply of indicators, planimeters, gauges, scales and thermometers. Altogether, the laboratory contains 14 steam engines of different forms. For work in applied mechanics there is a 100,000-pound Olsen testing machine, driven by power, for determining the strength of constructive materials under tensional, compressional and transverse stresses, and micrometer clamps for measuring the elongation of specimens under test.

Personal.

Mr. Charles Howard has resigned his position as General Manager of the New York & New England.

Mr. E. W. S. Moore has succeeded Mr. P. J. Seavers as Purchasing Agent of the West Virginia & Pittsburgh.

Mr. A. Child has been appointed Division Master Car Builder of the Chicago, Rock Island & Pacific, at Chicago, Ill.

Mr. J. Conroe has been appointed Division Master Mechanic of the Atchison, Topeka & Santa Fé at La Junta, Col.

Mr. Austin Corbin, who was recently elected President of the New York & New England, has retired from that position.

Mr. W. E. Symons was appointed Master Mechanic of the Atchison, Topeka & Santa Fé, at Raton, N. Mex., March 1.

General Superintendent T. J. Helm, of the Santa Fe Southern, has been promoted to the position of General Manager.

Mr. J. Kirk was, on March 1, appointed Division Master Mechanic of the Atchison, Topeka & Santa Fé, at Arkansas City, Kan.

Mr. M. J. Carpenter has been appointed to succeed Mr. A. D. Evans as Purchasing Agent of the Chicago & Eastern Illinois.

Mr. Henry C. Ayer, of Pedrick & Ayer, Philadelphia, has been chosen president of the Mexican International Steamship Co.

Mr. I. D. Barton has been engaged by the directors of the New York & New England Railroad as General Manager at $8,000 per year,

Mr. F. M. Gilbert has been appointed General Foreman of the Baltimore & Ohio shops at South Chicago, vice J. P. Hovey, resigned.

Mr. J. T. Lord succeeds the late George W. Gardiner as Master Mechanic of the Mandan, North Dakota, shops of the Northern Pacific.

Mr. E. W. Pratt has been appointed in charge of air-brake inspection at the West Chicago shops of the Chicago & Northwestern Railway.

Mr. Moses Rogers, who, from 1875 to 1882, was Master Mechanic of the Pennsylvania lines at Indianapolis, is now Superintendent of Machinery at the World's Fair.

Mr. M. J. Carpenter, President of the Duluth & Iron Range Railroad, has been chosen to succeed George W. Saul as President of the Chicago & Eastern Illinois.

Mr. William H. Blood, Assistant Superintendent of the Long Island Railroad, has been appointed General Superintendent in place of I. D. Barton, who recently resigned.

Mr. John Ortton, Superintendent of Machinery and Rolling Stock of the Toledo, St. Louis & Kansas City Railroad, has moved his headquarters from Delphos, O., to Frankfort, Ind.

Mr. Charles S. Price succeeds Mr. John Fulton as General Manager of the Cambria Iron Works, of Johnstown, Pa., Mr. Fulton taking his former position of General Mining Engineer.

The office of Mr. E. P. Lord, Superintendent of Motive Power of the C., C., C. & St. L. R. R., has been removed to Cincinnati, O., in the new building recently erected by the company.

Mr. Theodore P. Jacobs has been appointed Master Mechanic of the Toluca and Acambaro divisions of the Mexican National; including the Patzcuaro branch, with headquarters at Acambaro.

Mr. George F. Evans, formerly General Manager of the Louisville, Evansville & St. Louis Railroad, has been appointed Superintendent of the Southern Division of the Boston & Maine, to succeed Mr. D. W. Sanborn.

At a meeting of the full Board of the Interstate Commerce Commission, held at Washington, Saturday, March 19, Hon. William R. Morrison was elected Chairman to fill the vacancy made by Judge Cooley's resignation.

Mr. J. H. Ruxton has been appointed Division Master Mechanic of the St. Louis and Kansas City divisions of the Chicago & Alton, with headquarters at Slater, Mo., to succeed E. J. Whitington, resigned on account of ill health.

Mr. A. D. Evans has resigned as Purchasing Agent of the Chicago & Eastern Illinois to become President of the Beecher Town Company, which will establish a new industrial town on the C. & E. I. road 35 miles from Chicago.

President Harrison has nominated Mr. Judson C. Clements, of Rome, Ga., as a member of the Interstate Commerce Commission, succeeding the late Walter L. Bragg, of Alabama. The Senate has confirmed the nomination.

Mr. Charles J. Carney has been appointed Superintendent of Machinery of the Brooks Locomotive Works, at Dunkirk, N. Y. Mr. H. C. Crowell, of Westfield, will take the position formerly held by Mr. Carney, of Mechanical Engineer and Superintendent of the Dunkirk Engineering Works.

Mr. George Worthington, founder and for nine years editor of the *Electrical Review*, died Feb. 3 at the home of his brother, in Buffalo. By his death electrical interests lose a valuable friend, his influence having been potent for good in many ways in connection with the development of electricity.

Mr. James Montgomery, formerly General Superintendent of the Ohio Valley railway, has been appointed Superintendent of the Louisville, Evansville & St. Louis, with headquarters at Huntinburg, Ind. He virtually succeeds Mr. Geo. F. Evans as General Manager, the latter office having been abolished.

Mr. J. D. McIlwain, formerly Superintendent of the car shops of the Grand Trunk at London. Ont., was presented with a gold watch and chain by his friends and former employés, on the occasion of his leaving the service of the Grand Trunk to take the position of Manager of the Harvey Steel Car Works.

Mr. George W. Saul, President and General Manager of the Chicago & Eastern Illinois, has resigned. Mr. Saul became General Manager of the Chicago & Eastern Illinois in March, 1890. He had been for a number of years General Manager of the Evansville & Terre Haute system, and continued in that position when his headquarters were removed to Chicago.

Mr. A. B. Priest, a veteran locomotive engineer of the Michigan Central, has been a runner 47 years, and has served 46 years on the Michigan Central. He has been retired on partial pay on account of blindness. He has never been censured or suspended ; never saw a passenger hurt, and never had an accident whereby a passenger or trainman was hurt.

Mr. Porter King, of Springfield, Mass., a locomotive engineer of the Boston & Albany since 1844 (48 years), has lately resigned. Mr. King ran a locomotive several years before the date mentioned, and ran trains on the line of the New Jersey Railroad & Transportation Company when the cars were drawn by horses. He ran an engine 47 years before running over or injuring any person.

Mr. E. B. Wetmore has been appointed Superintendent and Master Mechanic of the South Side Elevated Railroad of Chicago. Mr. Wetmore was Superintendent and Master Mechanic of the Suburban Rapid Transit Company's lines in New York for several years, and had previously had considerable experience in the locomotive and passenger departments of the Third Avenue Elevated, of New York.

Mr. Henry B. La Rue, widely known in railway circles from his connection with various railway supply establishments, has begun suit for $250,000 damages against several persons who were instrumental in causing his arrest and confinement for 52 days in the New York State insane asylum at Willard. Mr. La Rue was only released from his imprisonment on a writ of habeas corpus, it having been shown that he was sane at the time of his committal, and that he was confined without due process of law.

Mr. John B. Wickersham, who died March 24, in Philadelphia, was widely known as a public spirited citizen, an inventor of note and a writer of merit. He was born in Chester County, Penn., and came from Quaker stock. Mr. Wickersham had a genius for invention. While in New York he conceived the idea of an elevated railway that would relieve the overcrowded condition of Broadway. This is claimed to be the first announced project of overhead transit. The illustrated newspapers as early as 1854 gave drawings of Wickersham's elevated terrace, and pictures of the benefit that would accrue to the people therefrom.

President Oaks and General Manager Mellen, of the Northern Pacific, while on a tour of inspection of the company's property, March 14, stopped at North Yakima, Wash., and, accompanied by E. V. Smalley, Editor of *The Northwest Magazine*, Walter Oakes and A. O'Farrell, took a drive. The wagon, drawn by four horses, was overturned by the current in a stream which the party attempted to ford. Messrs. Oakes and O'Farrell reached a shallow point, and Mr. Mellen swam ashore, but Mr. Smalley was carried into deep water by the current and went under twice before a small boat reached him. He was taken to the train and soon recovered.

Mr. F. W. Baldwin has been appointed General Superintendent of the Central Vermont system, succeeding Mr. James M. Foss, who has been appointed Assistant to the President. Mr. Foss is one of the oldest railroad men in active service in New England, having been born in 1829. He began his railroad service in 1846 as an apprentice in the machine shops of the Concord road. He became Master Mechanic of the Boston & New York Air Line in 1861, but returned to the Concord road in 1865 as Master Mechanic. In 1868 he was appointed to a similar position on the Vermont Central, and has continued in the service of that company to the present, as Superintendent of Motive Power, Assistant General Superintendent. He was General Superintendent for the last seven years.

Mr. Ross Kells, Superintendent of Motive Power of the New York, Lake Erie & Western, died on the morning of the 10th of March at Dansville, N. Y., where he had been for some months with the expectation of recruiting his health. For the past year and a half Mr. Kells' health has been so poor as to incapacitate him for active work, and for some time his condition has been such as to prepare his friends for the worst. The funeral took place from the First M. E. Church at Steubenville, O., on Sunday afternoon, March 13, and was the largest attended funeral ever held there. Many prominent railroad officials were present. A special train of five cars came in over the Cleveland & Pittsburgh road in the morning from Cleveland containing many officials of the Nickel-Plate and Nypano with employés. A special train of five cars over the Pan Handle brought in 275 of the employés of the shops at Dennison and Uhrichsville, while another special brought the leading officials of the Erie system from their headquarters in New York. Handsome floral offerings were brought from Susquehanna, Pa., and Hornellsville, N. Y. Mr. Kells was born in Steubenville, O., in 1840 and began railroading in 1856 as a brakeman on the Steubenville & Indiana road. He afterward went to firing and served in that capacity until 1861, when he became an apprentice in the Steubenville shops. Three years later he was made foreman of these shops, and later was promoted to be general foreman of the Dennison shops. In June, 1875, he was again promoted, this time being made Master Mechanic, which position he filled until 1882. In September, 1882, he entered the service of the New York, Chicago & St. Louis, filling the position of Superintendent of Motive Power. From January, 1883, until February, 1884, he was Superintendent of Motive Power of the New York & New England. In February, 1887, Mr. Kells became connected with the Erie system, his title being Assistant Superintendent of Motive Power. Mr. John W. Cloud resigned the position of Superintendent of Motive Power in January, 1889, and shortly afterward Mr. Kells was appointed as his successor.

Boiler Explosions in 1891.

Class of Boiler.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Locomotives	3	3	..	3	..	1	3	2	1	3	2	1	22
Steamships, Tugs, and other Steam Vessels	1	2	1	..	4	1	3	2	..	2	1	..	17
Miscellaneous	22	30	23	14	27	15	24	23	18	25	31	34	218
Total per month	21	26	19	14	24	14	24	23	15	26	26	25	257
Persons killed (total, 263)	23	36	11	7	21	22	23	13	19	36	20	32	
Persons injured (total, 371)	28	43	31	10	27	25	45	31	15	52	34	30	

—*The Locomotive.*

The new shops of the Cumberland Valley Railroad being built at Chambersburg, Pa., will be ready for occupancy the latter end of April or first of May.

The Louisville & Nashville Railroad is giving its train and engine men a course of instruction in the handling of the Westinghouse airbrake. A school car containing air-brake equipment for 30 cars, and in charge of competent instructors, is making a trip over the road, stopping at division points long enough to examine and give instructions to all employés connected with the handling of trains.

The Jaffa & Jerusalem Railway, mention of which has previously been made in these columns in reference to the landing and erecting of its locomotives, is to be opened shortly. The work of construction is being carried out by a French company, who began laying down the line in April, 1890. It is fully expected that the speculation will be a paying one. It is stated that over 40,000 persons land at Jaffa every year, in order to make a pilgrimage to Jerusalem and other spots celebrated in sacred history. The number of steamers and other vessels putting into the port of Jaffa is now upward of 800 a year, the destination of most of the passengers and merchandise they convey being the capital of Palestine. In evidence of the recent rapid growth of the traffic, it may be mentioned that Jaffa has trebled its population within the past thirty years. Tourists will be able to take a ticket from the port in question to Jerusalem and return for four dollars, and they will be able to do the journey in a far shorter time, with infinitely greater safety than hitherto.

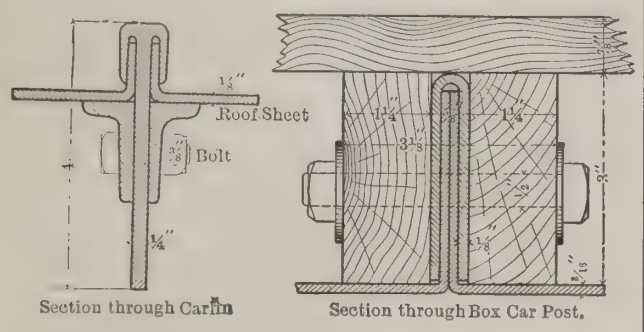
Accidents to trains in Great Britain during the nine months ending Sept. 30, 1891, resulted in four passengers and eight employés being killed and 643 passengers and 102 employés being injured. There were 33 collisions between passenger trains, 41 between passenger and freight trains and 22 between freight trains. Of the 458 tire failures 20 were engine tires, 16 were tender tires, four were carriage tires, seven were van tires and 411 were freight car tires ; of the freight cars 344 belonged to owners other than the railway companies, 344 tires were made of iron and 113 of steel, and in one case the material was not stated. Of the 169 axles which failed, 102 were engine axles, viz., 94 crank or driving and eight leading or trailing, 14 were tender axles and 54 were freight car axles; 25 freight cars belonged to owners other than the railway companies. Of the 94 crank or driving axles, 26 were made of iron and 68 of steel. The average mileage of 24 crank or driving axles made of iron was 249,419 miles, and of 65 crank or driving axles made of steel 235,259 miles. There were 450 people killed and 727 injured by accidents due to "their own want of caution or misconduct," such as passing over level crossings, tresspassing, falling between and out of cars, etc.

The Pennock Steel Car.

We illustrate in our present issue a steel car recently designed by M. W. Pennock, of the firm of Pennock Bros., owners of the Minerva Car Works at Minerva, O. The necessary special machinery for its manufacture is now being constructed, and as soon as completed a few sample cars will be built and put into service.

Among the several novel features of this design, the principal is the combining of the sills and floor. They are constructed by placing seven steel channel bars side by side and with the flanges downward, which thus form the sills, while the backs of the channels form the floor. The several channels are not secured by rivets, as that would make the car too difficult to dismember when needing repairs, but are kept by a number of cross rods which pass through the flanges of the channel bars immediately under the floor. It is proposed to make the channels 14½ inches wide and with 6-inch flanges, the metal in both web and flanges being one-fourth inch, their weight would be almost 22 pounds per running foot.

The body-bolster is formed by two or more rods which are applied like the cross rods above described, and a pair of rectangular compression bars, the upturned ends of which bear against the outside flanges. The tension rods pass through these ends and then secure them; the fastening at intermediate points is accomplished by both having an eye at their upper end, through which tension-rods also pass. The spaces formed between the channels and compression bars are occupied by suitable castings. Excepting that the lower bar is of slightly different shape at the ends, the construction of the end sill is identical with that of the body bolster.



Section through Carline

Section through Box Car Post.

What corresponds to the needle-beam and truss rod bearing of ordinary cars is in this case composed of a number of separate malleable castings which are attached to the body by one of the cross rods; a second rod passes through them immediately below the channels, and a third through the projections which form the truss road bearlngs and through the pipe separators. The truss rods are attached to the flanges of the floor channels with forked ends and pin connections, as shown.

The drawbars are placed practically on a line with the floor-frame; the attachments consist of suitably shaped irons which are fastened to the flanges of the center channel bar with rivets. The draw gear is protected by a cast buffing block contained within, and guided by, the members constituting the end-sills, and through which the drawbar passes. This buffer is provided with rubber cushions so arranged that they come into action when the draw spring is only partly compressed. The opening in the buffer is made wide to permit the car to pass curves more readily; it is fitted with suitable springs on either side to return the drawbar to its normal position.

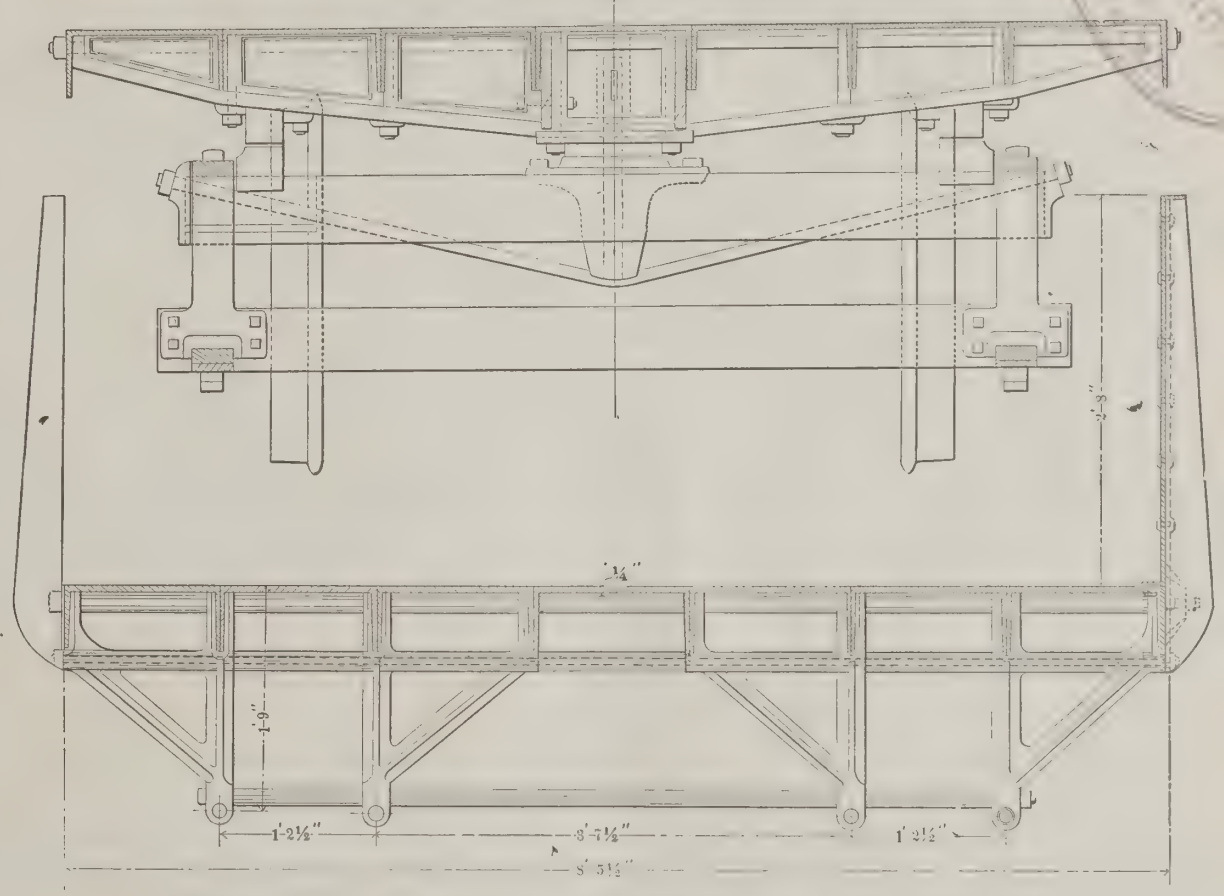
There are provisions made in this design for the different classes of cars. The sides of coal cars are formed of steel plates with a flange turned out at the upper and in at the lower edge; the plates are retained by U-shaped stakes, which are fastened to the body channels by the tie rods; the metal in the sides is three-sixteenth inch and that in the stakes is one-fourth inch thick.

No wood whatever is used in the construction of gondola or flat cars and very little in that of box cars, the grain lining and its supports only being of this material. For want of space the superstructure of box cars is not illustrated further than by two cross sections, one through a post, siding and lining and the other through the roof and carline showing the manner of making the joints. Referring to the former, the posts are U shaped in section and surround flanges turned on the side plates. For a distance of 4 feet they are flanked by 1¼ inches × 3 inches oak supplementary posts to which the lining is secured. The carlines are of the special section shown and engage with the flanged roof-plates, a pair of angle-irons serving as a lock. The carlines are attached direct to the posts, no side plate being used unless the large angle-iron under the cars be so considered. The thickness of the side and roof-plates is ⅛ inch and $\frac{3}{32}$ inch respectivly, and the former have corrugations pressed in them.

The names for the Pullman palace and sleeping cars are all selected by a daughter of Mr. Pullman, and she is understood to know something about what's in a name, as she is said to get $1,000 a year for that service.

The Allison Manufacturing Company, of Philadelphia, Pa., have secured the service of Mr. S. J. Johnson, formerly Business Manager of the La Fayette Car Works at Lima, O., as assistant superintendent of their car department through advertising in this paper.

PENNOCK STEEL CAR—SIDE VIEW AND PLAN OF FRAME.



PENNOCK STEEL CAR—SECTION THROUGH BODY AND BOLSTERS.

New York Railroad Club.

A regular meeting of the club was held March 17 at the rooms of the American Society of Mechanical Engineers. A paper on "Economies of Maintenance of Way" was read by Mr. Benjamin Reece, in which he showed that it is not enough to use heavier rails and fastenings to effect improvement and remedy defects in the track, but that very great improvement can be effected by thorough and systematic work on the roadbed, ballasting and ties. From statistics in regard to groups of important railways in several States, he showed that while ten years ago the annual expense for the renewals was about half that for rail renewals, it is now twice that for rail renewals. Very thorough work should be done in tamping, and the renewals should be carefully made. Some years ago, when in charge of maintenance on 900 miles of track, he ordered that all ties removed should be kept for his inspection, and he found a very large number removed prematurely. He suggested that this personal inspection is a good plan to effect economy, and is an object lesson to the track foremen, the men who have to decide what ties are to be removed. Many ties, especially those of soft wood, are removed on account of rail cutting, but this can be largely prevented by the use of steel tie-plates.

After the discussion a resolution was passed expressing sorrow at the death of the late Mr. Ross Kells, Superintendent of Motive Power of the New York, Lake Erie & Western R. R.

A short paper on the Fox pressed steel truck was then read by Mr. Brady, claming that it is easy of inspection, has only one-third the number of parts of the ordinary diamond truck, and is superior in many ways to any other form of freight car truck now in use. The steel plate is of 60,000 pounds tensile strength. The rivets are not found to work loose. A large number of roads are trying these steel trucks. Mr. Forney considered this a very promising form of truck, and that the arrangement of springs over the axle boxes instead of between them, as in the diamond truck, is a good one. A similar arrangement was introduced in some early Boston & Albany freight car trucks. As to corrosion of the metal, there is no trouble experienced with diamond trucks having channel-bar transoms, and in any case this could be provided for by special paint or a preservative treatment of the metal.

A patent has recently been granted to Mr. Ray G. Coates, Punta Arenas, Costa Rica, which relates to automatic air brakes in which the brakes are set by a reduction of the pressure in the train pipe. This invention provides an improved triple valve by which the brake cylinder may be supplied with air at the full auxiliary reservoir pressure or any part of that pressure, any loss due to leakage when the brakes are set being restored from the auxiliary reservoir pressure, the valve being used in connection with a reservoir of such size that the pressure in it does not noticeably fall by the loss of one charge of air to the brake cylinder. The triple valve has an auxiliary governing piston connected to and moving the main governing piston of the valve, the cylinder of the auxiliary piston being connected by ports with the brake cylinder.

Communications.

Editor National Car and Locomotive Builder:

Some weeks since we noticed in your journal an article by Mr. Griffin, of Buffalo, in reference to steel tired wheels, in which he says that the accident at St. George, Feb. 27, 1889, was caused by a broken steel tired wheel. We beg to correct this statement. The accident was due to a broken tire on the rear driving wheel of an engine which had been allowed to run to 1⅛ in. thickness. This statement is based upon the records. "Old Subscribers."

Winter Resistance of Trains.

Editor National Car and Locomotive Builder:

The article on "Winter Resistance of Trains" in the February National Car and Locomotive Builder certainly contains many pertinent facts, and you have covered the ground pretty thoroughly. It was always my observation that trains of live stock made better time in proportion to tonnage hauled in extreme cold weather than dead freight trains, due, no doubt, to their being kept warm through constant motion, while the dead freight trains often had to take sidings while awaiting opposing trains, and would, to use the expressions of the men, "freeze up."

You doubtless will recall instances where locomotives have been unable to move trains out of sidings on cold nights after a wait of an hour or so, when the only change in the condition of affairs during that time was brought about by the action of the cold upon the oil in the journal boxes. And again, in extreme cold weather, our rating of two empties for a load had to be remodeled to make sufficient allowance for the resistance arising from cause above named.

I can remember often hearing the remark from an engineer when asked how he would be able to handle a certain train on a cold night, "We'll go along all right if we can keep on the main line and don't have to stand on side tracks." H.

Firing Anthracite Coal,

Editor National Car and Locomotive Builder:

I was much interested in reading the article in the March paper on "Coal Consumption of Locomotives," and while the instructions as regards firing locomotives given in the article are plain and practical, and apply to locomotives burning both hard and soft coal, it seems to me that more might be said about the difference of firing hard or anthracite coal, and bituminous or soft coal.

In considering the firing of a locomotive with bituminous and anthracite coal, we have as far a dissimilarity of material to deal with as any two forms in nature's chemical laboratory, placed in the same class can exhibit, for while good bituminous coal contains about 30 per cent. of volatile matter, a good grade of anthracite contains about 4 per cent. This volatile matter is readily ignited, and is produced in such large quantities in proportion to the bulk, that much of it may be, and is, carried away in the black smoke so often seen rising from the stack of a soft coal burning locomotive. Then, again, anthracite coal contains about 85 per cent. of fixed carbon, against, say, 60 per cent. in bituminous coal. This carbon burns very slowly and requires more time and a greater quantity of oxygen than bituminous coal. In earthy matter, they each contain about 7 per cent., while in clinker and unconsumed coke there is twice as much in good anthracite as is to be found in equally good bituminous coal.

Having thus noticed the wide difference in the proporons of parts which are found in the two coals, it is, of course, self-evident that a very radical difference in treatment is necessary to secure the best results from each kind, and while the good, practical "soft coal" fireman may think that there is more science required in his way of firing, it will be found that just as much science is necessary to produce good results with hard coal. Each kind of coal wants and must have common sense treatment, which is really "science reduced to everyday practice." In order to secure the benefit arising from the combustion of the fixed carbon, it is necessary to have a larger grate surface, and as it is a usual practice to hang the water-leg of the boiler inside of the frames in both "hard" and "soft" coal burners, the only available plan to obtain more grate surface was to lengthen the firebox, and we have hard coal burners with 10 feet fireboxes, while even the shortest are nearly 8 feet long in heavy road engines.

Allow me to draw a pen picture of an anthracite fireman's work on a "mogul." In usual practice a fire say 5 feet long has been left in the back end of the firebox, 2 or 3 feet of fire being knocked out of the front end before the locomotive is put away in its stall. The locomotive will have from 20 to 120 pounds of steam, according to the condition of the fire when brought in, or the care used in banking the fire or keeping up the water supply. The first thing in getting the engine ready for the road is to be sure that all the ashes and clinkers are out of the open space in front, and then shove the grate bars into place. These grate bars are 2, 3, or 4 in number, and have heads projecting through thimbles in the back water-leg of the boiler, so that they can be pulled backward over the deck, and leave spaces about 4 or 5 inches wide, and of such length as may be wished, through which to knock out fire, dirt, ashes or clinkers. Hollow bars, filled with water, and in connection with the water-leg of the boiler at their ends, serve as permanent grate bars and fill up the spaces not occupied by the loose grate bars before mentioned. They vary in number from six to ten and have spaces of from one-half to one and one-half inches between them, through which the air required has to pass on its way to the fire. When the bars are in place the banked fire is "shoved down," that is, worked over, so as to get ashes and clinkers out, and leave a layer of say three or four inches of fire, which is to serve as kindling for the fresh coal which is then put on. A general practice is to use coal in small lumps, say five pounds or less, and put on an even layer of six inches, and "catch it up" by using the blower a little. With heavy work in prospect, the firebox is then filled up with lumps, care being taken to fill in the interstices so as not to leave too large spaces, by which the exhaust might tear the live coal from under the lumps and allow them to settle down on the grate bars, and thus permit the entrance of cold air around them. The "hard coal" firebox is about 16 to 20 inches deep at the front end and ranges from 18 to 24 inches deep at the door. When filled up for heavy work with fresh coal it is the usual practice to fill the front end say 12 to 16 inches deep and rising from that to 18 or 24 inches at the door, and in some instances even bringing it up above the door, care being also taken to have the sides of the fire deepest, as the air generally works up along the side sheets at any light spot it can find.

A fire properly prepared in this manner ought not to require any coal for a distance of two miles at hard work; indeed, six miles on heavy up grades have frequently been made without any further supply of coal, but the intelligent fireman takes an occasional peep at his fire to watch any low spots or indications of a hole being worked in the fire, and also keeps the door on the latch, so as to permit as much air to run in over the fire as she will "stay hot" with. Experience has shown that just as soon as the door can be opened on a wide crack a very limited amount of coal supplied at long intervals will keep up the supply of heat. After a run of some 20 to 40 miles it may become necessary to clean the fire, when the operations of knocking out the front end, working over the back end and filling up are repeated. This work is done, either while running down a favoring grade or while coming into a station or water tank, so that the hard coal fireman has the major part of his work to do while the engine is at rest, and has it easier between stations, while his colaborer on the soft coal burner works hardest while en route from one point to another. These are the general rules, but each engine of hundreds on the road has its own individuality, so to speak, which may make it differ from its mate that was built at the same shop. That this should be so is strange, but very small causes often produce surprising effects, and the most astonishing results have followed an adjustment of the draft pipe, transforming an engine from a very poor to a very good steamer.

In some instances also, by faulty adjustment, an engine will "haul her fire," that is, work it too hard at the back end and draw it to the front, and this is probably one of the worst freaks a locomotive can have, and one which once started becomes worse, because every exhaust takes from the rear and piles it on the front until the fire becomes so heavy in front as to let no air through, and so light back as to expose the bars, and then, of course, the steam will go back. With some classes of engines it is possible to start a counter action, even in these desperate circumstances, by pulling back the grate-bars, thus causing a part of the fire to run out of the front end, and thus bring it to a proper level. Sometimes it can also be remedied by using the poker, but as this involves opening the firedoor the risk of cooling off below proper pressure would dictate only using the poker as a last resort. Light spots, through overwork and neglect in feeding, become dead spots, and will have to be knocked out with a poker and other live coal pulled in place and quickly covered with fresh coal.

It will thus be apparent that the difference in the matter which constitutes "hard" and "soft" coal requires the different methods of firing. A larger amount of hard coal is burning at once, but as its combustion is going on at a slower rate than the more volatile parts of soft coal will allow, the actual amount consumed will not differ very much, but will be found in favor of hard coal. These general rules will have to be supplemented by careful study of each individual firebox and its combustion, or way of working the fire, to which must also be added a knowledge of the habits of the "man at the throttle," for much depends on knowing whether a fire is to be subjected to a heavy or a light exhaust. A. B.

Work has begun on the excavation for the piers of the projected Alton bridge over the Mississippi River. The structure will be of eight spans, with a draw on the Alton side.

The New York Central and the Rome, Watertown & Ogdensburg had a chance to use their rotary snow plows in clearing the snow after the storm of March 11, and the machines did good service.

One of the largest driving belts in the world has just been manufactured by the Boston Belting Company, and shipped to Denver, Colo. This belt is 150 feet long, 64 inches wide, 8 ply, stitched, and weighs 1½ tons. It is to be used as a driving belt by one of the traction companies at Denver, Colo.

Freight Car Roof.*

Acting upon your kind invitation to present for your brief consideration a paper on car roofs, I take pleasure in advancing the following ideas: First, let us consider what qualities are necessary in a good car roof and what obstacles are to be overcome. We name briefly obstacles as follows: 1. Car bodies rack because of loose joints arising from shrinkage of timbers, loss of nuts upon tie and brace rods, etc. Loose joints in bodies mean loose joints in roof boards, as well as sheathing and body lining, and rapid deterioration in all parts. 2. Climatic influences are a great obstacle to the life of car roofs. Frost, heat and moisture are three principal influences that cause rapid wearing out—heat in southern climates especially, and cold during northern winters. Incidentally, I might also name for southern and western climates the action of alkali upon metals used for car roofs.

Having thus briefly pointed out some of the "tearing down" causes, it will naturally follow that in order to overcome the first objection (that of racking) the roofing material proper should have, and be able to maintain under all conditions, the quality of elasticity. To overcome the second objection it should not only have the quality of elasticity, but should be able to withstand the effect of moisture, heat and cold, and the action of acids, such as are generated by the action of climate upon the various kinds of material entering into the construction of roofs.

Of all known substances that have been used in the construction of car roofs up to the present day no material will probably stand the test and retain all the necessary qualities as well as asphaltum, which is exclusively used by the Drake & Wiers Company in their asphalt car roofs, which to most of you are not new, there being many in use at the present time. In bringing to your notice this article, it will be necessary to refer to ancient history. It was used as a cement in the walls of Babylon, also for lining aqueducts and underground water courses. One eminent traveler testifies that he picked up pieces on the site of this ancient city that had been exposed to the action of the elements for at least 2,000 years, and that they were not only in a good state of preservation, but presented no evidences of disintegration.

Asphaltum is found about the shores of the Dead Sea near Jerusalem, in France, and several other portions of Europe, also in the United States. The principal source of supply is from Asphalt Lake in the island of Trinidad. Here it is found in its pure state and in inexhaustible quantities. Its peculiarities are, that water, heat or cold do not affect it. Under their action it does not become hard or brittle, but constantly retains its elasticity. We ask in this connection that you will not confound asphaltum with coal tar and other artificial pitches, which are generated by the use of heat and distillation. There are no like qualities in them. Coal tar upon exposure to heat or cold becomes brittle and easily breaks, having by exposure lost its elasticity. Our roofing material is composed of a heavy felt, thoroughly saturated with pure Trinidad asphaltum. The first of these roofs was applied in November, 1879, and the material is as good to-day as when applied 12 years ago. We respectfully submit herewith samples that have been taking from a car after having been in service for more than 10 years. The ordinary construction of our roof is well understood and needs no extended description. The undercourse of boards are laid lengthwise the car, and upon them is laid the saturated felt. This felt is made wide enough so that only two strips are necessary (one on each side) and overlapping from four to six inches at the ridge. Upon the felt are placed transverse and longitudinal ribs. Over the ribs is laid the outer course of boards crosswise. By the ribs between the under and upper course of boards an air space is formed.

We call attention at this time to a point too frequently overlooked, viz.: that a roof covered with felt saturated with asphaltum is a fair non-conductor of heat and a car so built will be cooler in hot weather than with other construction. Especially is this true regarding refrigerator cars. Experiment has proved that the difference in temperature in a refrigerator car with an iron roof and a like car with asphaltum roof and an air space is from 10 to 12 degrees. The saturated felt being practically indestructible, a cheaper quality of lumber can thereby be used with safety, thus reducing first cost. This construction protects the felt both above and below, avoiding thereby the making of holes so frequently found in iron roofs when no lower protection is given. A simple and easy experiment to prove our assertion regarding the power of asphaltum to withstand the action of heat and cold can be made thus: subject a piece of felt (saturated with natural asphaltum) to a heat of 200 degrees Fahr. for a number of hours (days will be better) and you will find when removed from the oven it has not lost its elasticity to any appreciable extent, while felt saturated with coal tar or pitch will become worthless within 48 hours after such a test.

In first cost we claim our roof is no more expensive than others, while its far greater durability is unquestioned. One of the trunk lines that has used our roof quite extensively for a number of years past has given us information to the effect that in no instance has it had to settle a claim for damage to freight on account of leaky roofs when our roof had been applied.

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* Read before the Northwest Railroad Club by Mr. J. P. Elmer, of Drake & Wiers, Cleveland, O.

New England Railroad Club Meeting.

WEDNESDAY EVENING, MARCH 9, 1892.

President Twombly occupied the chair, and announced as this was the annual meeting of the club, the first business in order would be the report of the Secretary and Treasurer. Mr. F. M. Curtis read his report for the past year, which showed that there are 192 members of the club; that there was an average attendance of fifty members at the meetings during the year. The following officers were elected for the ensuing year, President, Fred M. Twombly; Vice-President, John T. Chamberlain; Secretary and Treasurer, Francis M. Curtis, being the same officers who have served during the past year.

The subject selected for discussion at the May meeting was: "Rule 8 of the Code of Rules of the Master Car Builders' Association and other rules that may be suggested at the time." The subject for discussion on the present occasion was "Freight Car Trucks." A paper was to have been presented by Mr. John T. Chamberlain, but he was not present, and Mr. F. D. Adams opened the discussion.

Mr. ADAMS: As regards freight car trucks, I find that most of the men who have to do with them build such a kind of truck as they want, and there is considerable difference in their views as to what is the best, and I presume that will continue as long as railroads exist. There is a great variety of freight trucks now in use, some of them tolerably good, and some very poor, some making very little trouble, and others a great deal. The diamond truck is perhaps more generally used than any other, and it perhaps costs less to build them. Mr. James Brady has a new truck which he desires to put before the public, and I would like to hear what he claims in regard to it.

Mr. JAMES B. BRADY (representing the Fox Solid Pressed Steel Company, of New York): The truck which has been referred to and which is now running on a good many roads, and on most of the New England roads, is a pressed steel truck. We claim many advantages for it, and among others is its lightness; and again, it is in one piece, as against the average truck of 45 or 50 pieces. We have now run it two years and seven months on two roads, and it has been introduced on a great many roads in this country and abroad. I should like to hear any objections that can be raised against it, as we are trying to perfect it. We think it is very cheap for what we give and guarantee. On some roads where it is running the cars under which it is placed are two and a half tons lighter by reason of its use. This I get as positive information from the car builders; and on an average through the country it runs a ton lighter to the car. It carries 120 tons. We give a positive guarantee that it will not cost five cents in five years. If you can get that guarantee for any other truck I should like to hear of it. We think it will last fifteen years, but we guarantee it for five. Some people are afraid that the riveting will not hold. During the time it has been in use it has made no trouble in that way. From the Pennsylvania and New York Central roads we have reports that say in their experience with it they find the riveting is done well, and has not become loose. We do not ask anybody to take any chances with it; we take them by giving this guarantee. We have yet to hear of the first loose rivet on any of our trucks. It is modeled on the Boston & Albany truck, and there are 100,000 of that style of truck in use in the country. The whole truck is carried on springs, except the wheels and axles, which is a great point. We have it running under five large passenger engines on the Pennsylvania road, traveling 300 miles a day, fifteen or twenty days a month. Previous to this a set of trucks under the engine would run only three months, and they had to be continually looked after. One of our men saw an engineer on the Union Pacific the other day, who is using this truck, who said that on the first two or three trips he looked at the truck after every trip, but since then he had no occasion to examine it; with other trucks he had to look at them every trip he ran.

Mr. L. M. BUTLER: I have been trying this truck on a car for carrying stone, of 60,000 pounds carrying capacity, and I have seen it loaded with, I think, nearer 80,000 than 60,000 pounds, and I have never heard of any trouble with the trucks, or anything wrong about them. If this truck should prove after sufficient trial to give no trouble about the riveting it will certainly be a remarkable thing, something that has not been done heretofore. That has got to be demonstrated. I agree with Mr. Adams that the diamond truck properly constructed is about as good a style of truck as we have had anything to do with. It is an economical truck to take care of. They are got up for about $48 apiece, ready for the wheels. Considering the service they do, and the repairs that have to be done on them, there is nothing to criticise about that truck. The pressed steel truck may be better; I believe it to be a good truck. I believe the diamond truck is better than a large majority of the trucks running over the country.

Mr. COOLBAUGH: How about your truck being in one piece, Mr. Brady?

Mr. BRADY: The two sides are riveted together. There are actually four pieces when it is delivered to the works; when delivered to the road it is in one piece.

Mr. ADAMS: With regard to riveted trucks, the New York Central was equipped with a large number of riveted trucks, a good many thousands, and they were got up very scientifically by some of the best engineers, and this was supposed to be a truck which would last forever. They ran four or five years, and they have abandoned the whole of them, because they couldn't do anything with them when they got disabled, it was so much expense to try to keep them in order. We have a bridge built across the Connecticut River, which was put up some years ago, a riveted bridge, and there were eight or ten men at work on it all of one season, riveting it over. Consequently I associated the idea of this truck, it being riveted, with this bridge, but I may be mistaken about that, and I hope Mr. Brady will have better success with it than that. I approve of the principle of that truck. I believe a truck should be built so that it can be carried on its springs. I don't believe any truck can be a perfect success that rests on the journals absolutely, because I think the truck should have the service of the springs as well as the car body. I believe the correct principle is to have an iron-frame truck that rests on springs; it will last longer built in that way than if it lies upon the journal box as the diamond truck does. Of course it will cost more than the diamond truck, but it is a great deal better. We have trucks on our road that have been in use thirty years, and to all appearance they are as good to-day as the day they were put up. They are not strong enough to carry the loads that we are carrying now; consequently the truck has to be changed in its form, but the principle is the same. There is no difficulty in building the style of truck we use to carry any amount of load. We have those under 60,000 pound cars, and they will stand almost any amount of service. We have had 75,000 pounds on them many times without any apparent weakness being manifested. We have got Mr. Brady's trucks under two 60,000-pound cars, but they were sent off into the coal region and I have not seen them since. If the riveting never fails there is no chance for the truck to become deteriorated in any way, but the parts round the oil box may wear some. I think we have got to wait a year or two to see it thoroughly tested before a very intelligent opinion can be given upon it. I understand that some roads have given a second or third order for these trucks, and that is certainly in its favor.

Mr. BRADY: I want to say that 24 or 25 years ago I was in the employ of the New York Central, in the mechanical department, was clerk of the department, and am well posted in the truck business. There is one thing that Mr. Adams overlooked, and that is we are doing our riveting by hydraulic power, by machine and not by hand. We have as much riveting on the New York elevated road as anywhere, but we never heard of anything ever giving out in the riveting there, or of any accident occasioned by the riveting getting loose. The trucks that Mr. Adams referred to as making so much trouble on the New York Central road were made by contract work and done by hand. Their metal was thick, and our metal is thin, and we get a better purchase, and the riveting by hydraulic power in an immense advantage.

Mr. ADAMS: The great trouble with those New York Central trucks was that they were of the diamond pattern, and rested on the journals without any springs to relieve the riveting.

Mr. COUGHLAN: I think the time has arrived or nearly arrived when the difficulties in riveting which have been spoken of will be abolished, and that is when electric welding comes in; it is getting into extensive use in this country and in other parts of the world. When it is brought to a practical condition of working, by which ordinary men with little experience can weld electrically, the trouble will have vanished, and then, when that point is reached, there is nothing in this truck that cannot be made completely solid by that process, and that being the case, the objection which has been mentioned as to riveting will be eliminated. But it is too early to form an opinion on this truck. The urine from cattle which are conveyed in cars will soon eat away any substance, and the trucks under an ice car will be affected, the metal corroding, which will weaken it.

Mr. ADAMS: What is the price of this truck?

Mr. BRADY: $110 for a car and six dollars extra for center plates.

Mr. ADAMS: Without the springs and boxes?

Mr. BRADY: Yes, sir; I suppose we should call it a frame, not a complete truck. The Old Colony road is running it now. Mr. Lauder went into it deeper than anybody in New England. I am sorry he is not here, because he has given it much attention, and he is running some of the express trains with this truck, and the last time I was here I carried away his order for more, and so I suppose it had given him good satisfaction.

Mr. ADAMS: The truck is not as cheap at first cost as the diamond truck. Mr. Brady says the frames cost $110. Then you have got to add the wheels and axles, springs and brakes, the cost of which is quite a sum in addition.

Mr. BRADY: Isn't it a cheaper truck than your standard truck?

Mr. ADAMS: I think it is. We build a truck to stay. I was quite pleased with Mr. Coughlan's remarks, which I think are very much to the point. It is evidently a fact that it is subject to a good deal of corrosion, and unless Mr. Brady gets up some kind of paint to put on the trucks before they leave the shop, I should think there would be trouble; but I don't know that there is any kind of paint that would obviate it entirely, and I should be afraid there would be some parts where the water would get in and where the paint wouldn't get in.

Mr. BRADY: While I don't want to enter into any discussion on the subject of corrosion, I will say that there are perhaps a million and a half cars in the country, and I have been in the business for twenty-five years and I never heard of a car truck corroding in my life, and never heard that subject taken up before. There may be such a thing, but I don't believe that Mr. Adams ever had a case of a truck corroding, so I don't think that question need be brought up now, especially when we consider that every class of freight has been carried, even to the acids. I have spoken to some steel men on the subject of corrosion, and they simply laughed and said there would be no such thing. We will guarantee our truck against corrosion anyway. We have a good many in use in every country in the world except Spain, and that has never been raised as an objection, to my knowledge.

Mr. MARDEN: I think the aim should be as far as possible to secure a uniform truck and that we should agree upon the use of a standard. The truck that has been spoken of to-night has been pretty well ventilated, and I don't think I have anything to say in regard to that particular truck. I do believe, however, in having a truck where you can hang the brake on the outside. I am not prepared to say whether we ought to adopt the diamond truck, or a truck of the form which Mr. Brady has, or some other form of truck. We used the Jewett truck for a time, and it had one good feature; it did not depend on the bolt for strength, and so no nuts got off and it did not break down. I wish we might have experiments made to such an extent that we could feel convinced that some one pacticular truck was the best and was the standard to be adopted; and if we could adopt such a standard it certainly would be a very great benefit to the service; and then in case of an accident, where a truck got broken, it could at once be replaced wherever the car might be and if it was away from home it could be sent home without delay; and I think the tendency should be toward a uniform construction of both trucks and freight car bodies, of different carrying capacity.

The Western Railway Club.

At the February meeting President Peck occupied the chair. The subject discussed was Mr. D. L. Barnes' paper on "Recent Progress in Freight Car Construction and Design."

Mr. William Forsyth said that a very interesting part of Mr. Barnes' paper shows that in order to get sufficient strength in the modern cars the weight of the timber frame is greater than the equivalent strength in iron or steel, and that because of the recent reduction in the price of iron and steel beams from 3½ cents a pound to 2 cents a pound, a car can now be constructed with a metal underframe for about $10 more than the cost of an all-wood car, with about 5,000 pounds saving in total weight. Also, in addition to its strength as an underframe, the steel would give a strong continuous draft gear, for the drawbar attachments could be riveted directly to the steel beams and thus produce the strongest possible arrangement.

Mr. Bar said that about 40 steel cars of the Harvey design were running on the C., M. & St. P., but that up to the present there had been no developments of interest.

Mr. Southerland reported ten Harvey cars on the Chicago & Grand Trunk.

Mr. Gibbs: It seems to me that the whole paper would bear discussion by the members of this club. It shows the increased use of metal in the construction of portions of the car in which it has not heretofore been employed to any extent. It seems to me that there are parts of a car and trucks in which metal could be even more extensively used, as in the metal transoms and perhaps in the metal bolsters spoken of by Mr. Barnes. He mentions a composite bolster of metal and wood, but does not say how it is fastened together. I am not very sanguine that it will prove a success, particularly in the way he shows it, with the metal the same depth as the wood in the bolster. The pressure of the load would fall on the narrow metal bars instead of on the broader surfaces afforded by the wood; and this, together with the modifications due to shrinkage, tend to destroy the unity of the bolster immediately. However, there are others which could be devised of metal, which it seems to me would answer the purpose.

Mr. Barnes incidentally refers to a pressed steel truck; I presume it is the Fox truck, as to my knowledge that is the only truck which is made entirely of pressed steel. We have examined that truck, and I think we have a set or two on the road. We are going to give it a trial; it seems a very sensible form. One thing about it which might be criticised is the fact that the weight is carried entirely at the center plate. There are no transoms, in the ordinary acceptance of the term, and the weight is carried at the middle of the frame. But this very rigid construction may not be disadvantageous where a spring is employed above the journal box, as is the case in that truck. It always seemed to me that a journal spring would be very advantageous. But I doubt if we are sufficiently advanced to want a car like the one he shows there, all of metal. The paint, of course, is a small matter in itself, but it seems that the work of painting the metal will be a very serious matter. The paint will not stick unless the metal is scraped and prepared, which increases the cost. There would also be the greater cost of repairs when they are made.

Mr. Schroyer: We have found the composite bolster to be preferable to the trussed bolster. I do not consider that any trussing that could be put on a thing of that kind could be of any service unless the rods are put under initial tension sufficient to arch the bolster. I made some tests a short time ago, after reading an article in one of the railroad papers about car bolsters. I found that the ordinary wooden bolsters, without any iron plates, under the load of 55,000 pounds, had a deflection of one-eighth of an inch. The same bolster, with the iron plate in it, sustained a load of 84,000 pounds, which proved conclusively to my mind that a composite bolster was very much better than the wooden bolster alone. When we discarded the plain wooden bolster we employed the truss bolster, but we found much trouble in maintaining the truss rods. The ends would wear off or the rods would break, and we adopted the composite type, which we find very satisfactory. While it is true that the shrinkage of the timber will loosen the plates to some extent, all parts get their bearings, and we do not notice any difficulty at all as the result of the shrinkage of the timber.

Mr. Barr: I have had my attention called, in the past three or four months, to a lot of cars that are running over our road having composite bolsters. The wooden portion shrunk and caused a great deal of trouble by the side bearings breaking on these two projecting plates of metal. That, of course, could be remedied by making the bars less than the bolster in depth.

Mr. Schroyer: In framing a composite bolster it is an error to make the depth of the plate the same as that of the timber. In our bolster the center piece is rabbeted on its edge to take the iron plate and the amount of the timber that remains on that center on the bottom of the plate is $1\frac{1}{8}$; the plate is 6 inches by $\frac{7}{8}$, and the timber is $7\frac{1}{8}$ inches deep.

Discussion on this subject here closed, and the President called attention to the action of the Central Railroad Club at its recent meeting, in which it was shown that much trouble was caused by No. 8 of the rules of interchange.

Mr. Barr: The practice under rule eight has been rather peculiar. I noticed Mr. Adams' remarks before the Central Railroad Club on rule eight, and yet he wants to charge us for a brake shoe applied by him to replace one that was lost. We object to that, as the shoe may have been worn out. I am receiving circulars from a great many roads asking us to dispense with the labor charge for changing shoes. I am perfectly willing to co-operate with any one; if they will agree not to charge labor I will agree not to charge them; if they want to charge a half hour I am willing to charge a half hour in return; if they want to make it an hour I am willing to charge an hour in return. But the matter as it now stands is indefinite, and something should certainly be done. If a committee were appointed to draw up a list of reasonable charges for different classes of repairs that are frequently made (both material and labor charge) I believe that it would be a very good thing to present to the Master Car Builders' Association.

President Peck: I think so, too. I have received letters similar to those mentioned by Mr. Barr, but I think that the only way to obtain the desired result is to bring the matter before the convention and get it universally adopted, for if only a few go into it it leads to confusion. There is another matter to be considered; the Central Club recommends a change of wheel gauge. The master car builders allow three-quarters of an inch variation in the distance between flanges, and they want that changed to three-eighths. They want more uniformity. It would probably be a wise thing to have a committee appointed and anybody could refer to that committee such matters as they wish to hear discussed at another meeting. I will appoint Mr. Barr, Mr. Downing and Mr. Schroyer as a committee to report at the next meeting.

Mr. W. E. Lockwood, of Philadelphia, appeared before a committee of Congress on March 3 in favor of a bill to appropriate $25,000 to enable the Franklin Institute, of Philadelphia, to test the force of what is known as the hammer blow of a locomotive's driving wheels.

He Owned the Road.

Among the first railroads built in the United States was a little line about twenty miles in length. In the course of time a big line was constructed through the same country. The original line became merely a branch. For many years it was run in a cheap way, with one locomotive, one engineer and two or three freight cars.

Finally a new general manager was appointed. He had not been in office but a week when he sent for the one lone conductor who had held the position ever since the road was built.

"I would like to have your resignation," said the general manager, when the conductor appeared.

"My resignation?" inquired the conductor, in astonishment.

"Yes, sir; yours."

"What for, pray?"

"Well, I want to make some changes and get new blood in the line," was the general manager's reply.

"I won't resign," answered the conductor.

"Then I will be compelled to discharge you, a step which, for your sake, I had hoped I would be saved from taking."

"Young man, you will not discharge me. I own a controlling interest in the stock of this railroad and elect the president and board of diretors.

The Illinois Central has selected a site near the south end of Lake Front Park, Chicago, for the erection of a large passenger station to cost about $1,000,000.

The formal transfer of the Pittsburgh and Western Railroad to the Baltimore and Ohio Company was quietly made in Baltimore on March 17. All general officers of the B. & O. will fill the same places on the Pittsburgh & Western.

The French steamer "Dupuy de Lome," Captain Dechaille, which sailed from New Orleans on Feb. 14, and which reported on her arrival at Havre, on March 10, that she had run short of coal on the passage, burned 20 tons of wheat of her cargo.

In the Court of Errors, of Trenton, N. J., an opinion was rendered Feb. 29, upon the question of whether in that state the railroad companies must ring a bell near a crossing or blow a steam whistle, or were obliged to do both, in order to avoid accidents. The Court held that they were not so obliged.

One-fingered Jake thus spake:
"Bill, he was raw, he said 'twas a buzz saw;
I said he lied, 'n' then I tried
T' p'nt out t' him along its rim
Thar wan't no teeth in sight—
Zipp! Flip! Bill was right."

According to the annual report of the Railroad Commissioners of Massachusetts the total number of passenger cars running in that State that are fitted for heating by steam from the locomotive is 2,291, or 73 per cent. of the whole number of cars used in the winter season. The increase over last year is 944.

Mr. James McCrea, First Vice-President of the Pennsylvania Company, has issued in circular form, instructions to the heads of departments regarding promotion of men in the employ of the company to the effect that all promotions in future must be made from the ranks of the employés of the company.

Bids for fuel for the World's Fair were opened at Chicago on March 19, the lowest bidder being the Standard Oil Company, with its offer of three barrels of oil as an equivalent of one ton of coal at 70 and 72½ cents per barrel. The officials of the Exposition have not yet decided whether to use coal or oil.

The construction of the world's longest railroad is progressing rapidly along the river valleys and across the steppes of Siberia. The western extremity of the road is the mining town of Miask, on the eastern side of the Ural range, and its eastern terminus is at Vladivostok, on the sea of Japan, making a total length of 4,785 miles.

The erection has begun of the Reading terminal trainshed, at Market street, Philadelphia. The arched roof will have a span of 266 ft. 10¾ ins., and it will be 90 feet high from the floor of the station and 120 feet from the street level. The train shed will be 553 feet long, and the station proper 110 feet more, or 663 feet in total length. The shed will contain 13 tracks converging into 9 at the north end.

In the second trial of a suit for $50,000 damages against the Sault Ste. Marie & Southwestern, brought by Chas. Gibson, a former engineer, who was injured in an accident on that road, Frank Gaul, who was Gibson's fireman, coolly announced that his testimony at the first trial was false, adding, "I wanted to help Charlie out." The judge promptly committed Gaul to jail on the charge of perjury.

Railroad accidents have become so frequent in France, and the results have in several instances been so disastrous, that the French Department of Public Works has taken the matter in hand, and will undertake to devise preventative measures. One of the first results of its deliberations is a circular letter, recently sent to the various railroad companies, in which train detentions are pointed out as fruitful causes of accidents.

The work of relocating and rebuilding the Southern Pacific track west of Yuma, Ariz., on the sections that suffered so severely from last year's floods, has been practically completed. Of this portion of the road, which has been subject to annual washouts, causing much expense and delay, the roadbed has now been raised about twenty feet, and many trestles constructed to allow free passage for flood water. The work has taken six months' time, and cost $2,000,000.

A brakemen on the Westchester branch of the Pennsylvania Railroad, Harry Herr, was handling the brake of a gondola car recently which was being pushed by the locomotive. The brake shaft broke throwing him to the ground, and the three cars passed over his body. A flaw, which it was testified could not be seen, on the brake shaft, was the cause of its breaking. The verdict of the jury was that death resulted from the deceased falling and being run over, consequent on the breaking of a brake shaft.

The Baldwin Locomotive Works have completed two suburban engines from new designs by Mr. L. B. Paxson, Superintendent of Motive Power of the Philadelphia & Reading. These engines have Wootten fireboxes, six drivers, a two-wheeled truck in front and a six-wheeled truck back. They are intended to burn anthracite slack and have been put in suburban service at Chicago on the Illinois Central. They differ from other Wootten engines in having the cab at the back of the boiler, so that the fireman and engineer are together.

An active competition has for a long time past been carried on among the English iron-masters as to the degree of thinness to which cold iron could be rolled. In one case the sheets have been rolled to an average thickness or thinness of the eighteen hundredth part of an inch—in other words, eighteen hundred sheets of this iron, piled one upon the other, would measure only one inch in thickness. And this marvelous fineness of work may be more readily understood when the fact is bore in mind that the great number of twelve hundred sheets of the thinnest tissue paper measures a slight fraction over an inch.

The husband of an English lady traveling in Italy put her into a compartment of a passenger train and went to attend to the baggage. After he had gone a villanous-looking fellow got in, and presently the train started off, the husband not appearing. The lady was naturally a good deal disturbed, and the way in which the stranger looked at her did not tend to diminish her agitation. Suddenly, still with his eyes fixed upon her, the man took from his pocket a large claspknife and opened it. Then he rose, and deliberately cut from the window blinds their cords, and began to knot them together.

The lady was terrified almost to death. She expected to be strangled on the spot, and began appealing to the strangler to spare her. He only laughed brutally, answering her in Italian, of which she did not understand a word. Then he pulled off his coat and waistcoat, and just as the terrified women was almost prepared to fling herself out of the compartment of the swiftly moving train, he knotted the cords so as to piece out a broken suspender, put on his coat and waistcoat, and sat quietly down in a corner, where he went quickly to sleep.

The Des Moines & N. W. R. R. Co. are having built by the St. Charles Car Company three coaches and two baggage cars.

The Cincinnati Corrugating Company, of Piqua, O., are doing a large business with their corrugated galvanized iron car roofing, also roofing for buildings.

The Long and Allstatter Company, of Hamilton, O., are very busy. They are constantly making improvements in iron working machinery, especially in their punch and shear department.

The St. Charles Car Company have just completed and delivered 10 elegant first-class coaches for the Burlington & Missouri River R. R. in Nebraska. These cars are mahogany finish and equipped with Scarritt's high back seat.

The Dayton Manufacturing Company, Dayton, O., having purchased the machinery and stock of Post & Co. of Cincinnati, have a very large assortment of car lamps, trimmings, etc. They are preparing a new catalogue, which will contain when finished about 800 pages.

The Congdon Brake Shoe Company, of Chicago, Ill., is erecting an iron building 200 × 110 feet which will contain a twelve ton open hearth steel furnace and a twenty-four pot crucible steel furnace. They expect to have the plant in full operation by June 1, making general steel castings and material for the Ross-Meehan Brake Shoes.

The Dayton Malleable Iron Company, Dayton, O., have recently furnished a very large number of the freight car door fasteners manufactured by them to different railroad and car companies. This car door fastener is very simple and at the same time very effective. There are large numbers of them in use throughout the country.

The Terre Haute Car Company, of Terre Haute, Ind., are erecting a large building for a new foundry with a capacity of 300 wheels a day. It will be equipped with the Detroit Foundry Equipment Company's labor-saving devices. They manufacture wheels by the Barr contracting chill method, and in their car department they are very busy with a number of orders on hand. They have a capacity of fifteen cars per day.

The A. French Spring Company have introduced a practice of sending out outline prints of their springs with spaces for entering leading dimensions of the springs to be ordered. The blank contains all particulars that must be known, such as length between centers, number of plates, with dimensions, size of hangers, size and form of bands, weight on engine or truck, etc. The blanks are printed in copying ink and all particulars of an order can be easily copied.

The Wood car platform gate has been placed on another 100 coaches of the New York, New Haven & Hartford Railroad. This is the fourth requisition, and makes a total of 1,600 gates that are on the cars of that company. It has also been placed on 50 coaches now being built by Osgood Bradley, of Worcester, Mass., and 25 by the Laconia Car Company of Laconia, N. H. Several Western railroads are experimenting with it, and, wherever used, it has been found to give satisfaction.

Mr. C. C. Jerome, of Chicago, Ill., manufacturer of the Jerome packing for locomotives, etc., is full of business, trying hard to keep up with orders. He has a well equipped shop, with the latest improved machinery necessary for his use. His business has doubled during the past year; orders on his books show the names of the leading railroad companies and locomotive builders. He has recently issued a very complete catalogue, showing the different styles of packing and instructions how to use it.

Mahogany is the "King of Woods" for interior decoration of fine cars. On a visit to the E. D. Albro Company, of Cincinnati, O., we saw a cargo just received of the largest and finest logs of the Mexican mahogany, known as Tabasco wood. The company was busy converting and shipping the lumber and veneers to various consumers. Some of the logs measured 40 inches in diameter, and very few seemed less than 24 inches, all being of that high color and texture so much desired by those using the finest kind of mahogany. A large shipment of white mahogany (Prima Vera) was going forward to a prominent firm of car builders.

The Baltimore & Lehigh R. R.Co. have equipped all of their passenger cars with the Morton Safety Heating Company system of heating. A very satisfactory test was made on the morning of Feb. 6, when the thermometer showed a temperature of 7° above zero outside of the car and 16° inside. In 20 minutes from the time the steam was turned on the temperature rose to 56° and gradually increased to 72 During the five hours run the steam was turned on four times only for five minutes at a time at long intervals, total application of steam, 40 minutes. On the return trip steam was turned on four times for three minutes at a time, using steam for only 12 minutes. On the arrival of the train at Baltimore the temperature in the cars was 70°, outside it was 20°.

The Indiana Car and Foundry Company, of Indianapolis, Ind., is the name of the company that bought the plant of the Indianapolis Car Company. Some time ago it was organized under the laws of the State of Indiana with a capital of $300,000, $150,000 of which has been paid in. The officers of this company are desirous of selling about $50,000 worth more of their stock to enable them to successfully carry on the business of building cars. The plant was especially planned for car building and is in one of the best locations for that class of work, it being on the belt line and accessible to all the railroads entering Indianapolis. The buildings and machinery are in good condition, and there are about 15 acres of land valued at from $2,500 to $3,000 per acre. The company claim this is an opportunity seldom offered for some one with a knowledge of car construction to take an interest in the business and to make a profitable investment. Further particulars will be given upon application.

The Hoyt & Brother Manufacturing Company, of Aurora, Ill., manufacturer of wood working machinery, has lately been reorganized, adding $150,000 to its capital stock. The officers of the reorganized company are Willis Hoyt, President; H. A. Higgins, Vice-President and Superintendent; C. C. Hackney, Secretary and Treasurer. Some years ago the company introduced the first successful double cylinder chain feed surfacer ever placed on the market. Following this successful venture came the gradual production of this class of machinery until 23 sizes of planers and matchers and eleven different and standard kinds of surfacers and other wood-cutting machinery were manufactured by this firm. This production was increased from year to year until at the present time the illustrated catalogue of the firm represents over 300 different sizes and patterns of wood-cutting machinery, all built in the highest style of mechanical art by experts who have spent many years in acquiring proficiency in this class of work.

However well designed a manufacturing establishment may be, changes are almost constantly going on as more recent improvements are incorporated with the original plant. Considering this certainty, much more valuable and satisfactory is the self-contained machine which may be readily shifted from place to place and do its work as well when located but temporarily as when all the precautions are observed for an indefinite operation. We notice from a photograph a combination of such machines at the works of the Laurel Hill Chemical Company, Laurel Hill, L. I. Two timbers laid upon the ground and braces by strut pieces from the ceiling form the bed of the outfit, which consists of a 25-horse power Westinghouse engine driving a salt cake crusher and grinder. Each machine is complete in itself and independent of its surroundings, and the engine easily runs with perfect safety at a speed of 400 revolutions per minute on its slender foundation.

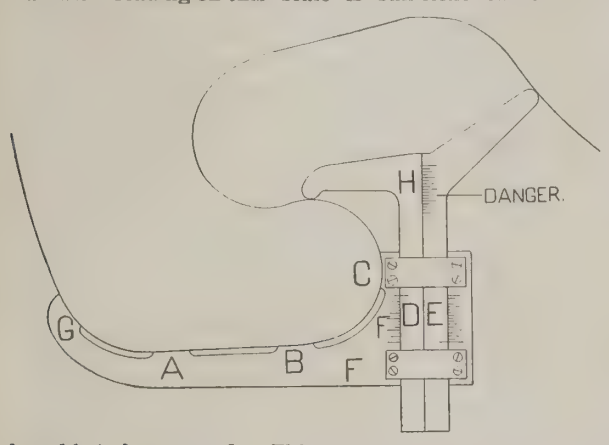
It may be interesting to note in this connection the extremes of speed in the power and its application. While the plant is not intended as a permanent one, the character of the production is no different from what could be obtained under more favorable conditions, and each machine yields as a whole to the inequalities of the foundation with no undue tendency to strain or warp the working parts.

The rapidly increasing business of the Consolidated Car Heating Company has made it necessary for them to enlarge their plant. Heretofore the factory which they have occupied they have leased, but recently they purchased a tract of land at the north end of the city of Albany and have already let contracts for the erection of a new factory and warehouse. The first floor of the new building will be used exclusively for a shipping room and wareroom for all finished material. A portion of the second floor will be used for offices and the remainder for lathes. The third floor will be used for drills, brass lathes and handwork in putting up their various apparatus. The fourth floor will be used exclusively for tests and experimental work. This floor will especially be equipped so that all apparatus furnished by the Consolidated Car Heating Company will be thoroughly tested before leaving their factory, so that defects in all material supplied by them will be reduced to a minimum. Their factory will be equipped with the latest improved and best machinery for doing their work, the greater part of which is special. Aside from this will be the engine house and auxiliary buildings.

The contractors for the building are already at work, and the buildings will be rapidly pushed to completion. The company will probably occupy their new building on or about June 1.

A Safety Coupler Gauge for Worn Couplers.

The gauge consists of three parts—two sliding fingers *D* and *E* and a guide *F*. The guide locates the gauge. It is placed in contact with the points *A*, *B* and *C* of the knuckle, which are never changed by service. Therefore the guide *F* is always in a correct position in reference to the knuckle, even on worn couplers. The projection *G* is located according to the Master Car Builders' lines, and the conformity of the knuckle to the gauge at that point determines whether or not the knuckle is on the line. The finger *D* slides to and fro in the guide, and has a graduated mark which passes a graduation on the guide *F*. When the knuckle is of proper thickness at the point this graduating mark is opposite one extremity of the scale. When the knuckle is worn thinner the position of the graduating mark on the scale shows the amount of decrease in thickness. The same is true of the sliding finger *E*. It has also a graduated mark working on a graduation on the guide *F*, which shows when the guard arm is in a proper position. The variation of the guard arm or an improper opening of the knuckle is shown by the reading on the scale next to the sliding finger *E*. A worn coupler will usually have a worn guard arm and a worn lock, which allows the knuckle to open. On such a coupler the gauge will show a thin knuckle at *D*, an increased opening of the knuckle and a worn guard arm at *E*, and the sum of all these variations and the true condition of the coupler at *H*. Of course, there is a period in the life of a coupler when the knuckle must be renewed, as the opening, as shown by the scale *H*, will be too great. The danger line may be located somewhere near the five-eighths of an inch reading on the scale, as shown, but this is a point that must be determined by experience. Some roads have decided already that one-half inch reading on this scale is sufficient cause for the



knuckle to be renewed. This gauge is intended for worn couplers. It is, of course, useful for new couplers, but has not the scope for that class of work which is given by the Master Car Builders' standard gauges. This gauge is manufactured and sold by the Northwestern Equipment Company, Rookery, Chicago.

Boston Belting Company's Works.

The Boston Belting Company is the original manufacturer of vulcanized rubber goods, and has a world wide reputation for the excellence of its manufactures. It was established in 1828 in Roxbury (now a part of Boston), where the works are still located. The works are the largest in the world devoted to the manufacture of mechanical rubber goods, and occupy more than two acres of ground, mostly covered with substantial four story buildings. The machinery, which is of the most powerful and improved kind used in this manu facture, is operated by several large engines. Employment is given to 500 operatives, and more than 6,000,000 pounds of pure rubber and cotton duck and cloth are used yearly, in the manufacture of a superior quality of rubber belting for transmitting power to all kinds of machinery. The extent of the line of goods made by this concern is indicated by the following list. Rubber hose for conducting water, for railroad use; air brake hose for the Westinghouse automatic airbrake; steam hose for car heating purposes and blow back hose; rubber packing for packing water, steam and air joints; rubber valves for use in connection with stationary and marine engines, steam pumps and similar mechanisms; rubber blankets for newspaper, book, lithograph and other printing presses and calico, satinet and wall paper printing machines; rubber covered rollers for use in cotton, woolen and paper mills, print and dye works and bleacheries; rubber deckle straps used on paper making machines; rubber suction hose for fire engines and for mining and marine and other purposes; rubber gaskets, tubing, springs, etc., and a great variety of other articles. The daily output of the works is 12 tons of manufactured goods, which are distributed over the civilized world. The company has stores in Boston and New York and agencies in the leading cities of the United States and Europe. The manufacturing agent and general manager, James Bennett Forsyth, has been with the company more than a third of a century, and is the patentee of most of the useful inventions which have so greatly aided in building up its business.

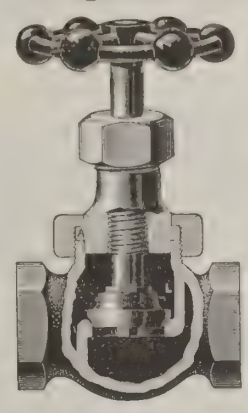
Messrs. Drake & Wiers, of Cleveland, O., have recently received orders for a large number of their freight car roofs.

The Buffalo Forge Company, Buffalo, N. Y., have just issued a new catalogue of their Steel Plate Planing Exhausters, which recently have been very materially improved in construction: A notable feature of this catalogue is the large number of hood diagrams and forms of connections for wood-working machinery from actual measurements of successful plants which have been installed by this company in some of the largest wood-working establishments in the country. More complete and detailed information regarding the successful application of exhaust fans for similar duty is embodied in this catalogne than anything of the sort which has appeared.

Regrinding Globe Valve.

We present with this a sectional view of a valve which possesses some features of special merit. Instead of the hub being threaded direct to the body of the valve, it is merely fitted into it plain, and rests upon a flange which fits upon the upper edge of the opening, as shown. The hub is then secured by a nut which fits over the flange, and is threaded to the outside of the body of the valve.

The result of this arrangement is that the valve can be



reground at any time with the greatest facility, because all that is necessary is to loosen the nut, remove the hub, place a little emery and soap under the disk, and then replace the hub, leaving the nut loose, so that the hub is free to turn with the stem during the grinding. A piece of wire is passed through a hole provided for that purpose in the lower end of the stem and disk, so that the disk will turn with the stem during the grinding, which, of course, it does not necessarily do when the valve is in use. The hub being in place when the grinding is done effectually centers the stem and holds it in proper place, so that the regrinding is done correctly. The valve can thus be readily ground while in position, and in many cases does away with the necessity for breaking connections. The disk is also easily replaced when required. These valves are also extensively used on locomotives, steamers, and in the United States Navy on cruisers, where the requirements are very severe. They are made only by the Lunkenheimer Brass Manufacturing Company, Cincinnati, O.

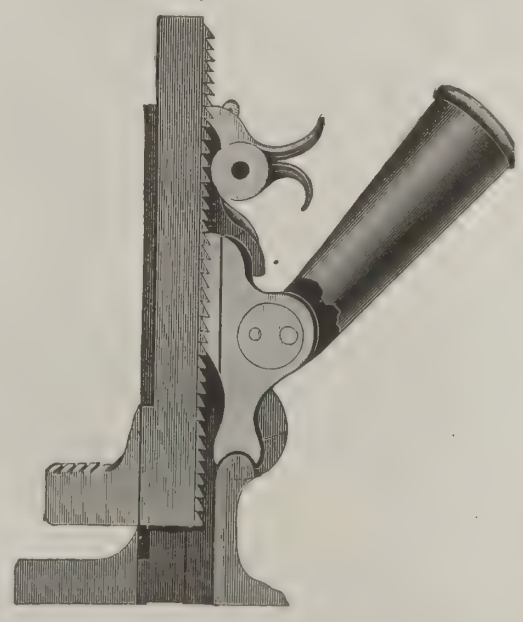
The electric headlights manufactured by the National Electric Headlight Co. of Indianapolis, Ind., are now in use on about a dozen western roads, and are reported by the officers of the roads as giving good satisfaction, while causing no more trouble in their care and maintenance than ordinary headlights.

The dynamo is driven by a small four cylinder engine, and both are on one base and weigh 650 pounds. They measure 28 inches long, 15 inches wide and 17 inches high. Their speed is 425 turns per minute. This plant is placed on top of the smoke-box, immediately in front of the stack. The headlight case is moved forward, leaving a space of 20 inches between it and the stack. Steam is taken from the dome, the throttle and lubricator being placed in the cab. A ½-inch iron or a ⅝-inch copper pipe is laid under the jacket from the cab to the small engine of the plant, or a ¾-inch pipe along the footboard. The exhaust goes into the front end.

The electric lamp can be placed in any ordinary case and reflector by removing the oil lamp. It is provided for adjustment in every direction, but when once set it need not be changed. A half turn of the ⅛ inch throttle is sufficient to run the light, which can be started and stopped at will whether the locomotive is running or not. One carbon, which can be replaced in a minute, costing 1½ cents, and ½ pint of lubricating oil will run the plant 8 hours, and that gives the actual cost of running the light.

The Maxon Jack.

The jack, an interior view of which is given herewith, is designed for heavy work, such as handling coaches, loaded freight cars, etc. It has a cam inside of the lower pawl, and instead of the weight being moved around the cam, as is usually done, in this jack the cam revolves inside of the



pawl and is thereby placed almost directly under the load. The size of the cam gives a very large wearing surface which adds largely to the durability of the jack. Of course, like all other jacks, this will wear in time, but it can be used until parts are completely worn out without lining up. Manufactured by the McSherry Manufacturing Company, Dayton, O.

Mr. William C. Baker, manufacturer of the Baker Car Heater, says that there is an intermediate substitute for heating railway cars between the old fashioned and properly named "deadly car stove" and steam from the locomotive. Mr. Baker says that if common observation has not suggested this, he has for the past five years done so by the introduction of his flexible steel car heaters, constructed in the same manner as are the safes in the express cars; and that he believes depending upon a source of heat that is often disconnected from the cars is erroneous.

A Dry Closet.

This "Standard" dry closet is intended to be used in passenger cars where it is deemed best not to introduce water service, and to take the place of the old-style hopper and urinal. The hopper, which is made of porcelain of "ivory" white finish, handsomely decorated, flares out at the top to the full size of the seat, forming a drip tray and hopper in one piece.

By the use of a seat-raising device the lid and seat are so arranged that when the seat is raised the lid follows it to a perpendicular position; in this position it is intended to be used as a urinal, and the top of the hopper is so large that it cannot be used for any other purpose. The seat, however, on reaching a perpendicular position, becomes automatically disengaged from the lid and can be returned to its place,

leaving the lid up. The wood work should be so constructed that when the lid and seat are both *up* they will remain so; but when the seat is put down the lid must be held up by the back of the "operator;" this insures the lid being closed after the operation is finished, so that the next person desiring to use the closet will not find the lid up and the seat down and possibly soil the seat.

As the use of this dry closet dispenses with the "urinal," the cost does not exceed that of the old device, while it occupies less space and is much more sightly and less offensive. Made by the Henry C. Hart Manufacturing Company, Detroit, Mich., who are also manufacturers of a water closet thst is now in use on a large number of sleeping, parlor and private cars, an illustration of which will appear in a future issue.

The American Steel Wheel Company of Boston and New York are placing their solid steel wheels on quite a number of Western railroads.

The business of Howe, Brown & Co., Limited, having outgrown their warehouse at 228 Lake street, Chicago, they have arranged to erect a building 60 × 150 feet, on Jefferson Street, near Lake.

There are now in use on the different railroads throughout the country upward of 300,000 National Hollow Brakebeams manufactured by the National Hollow Brakebeam Company of Chicago.

The R. Bliss Manufacturing Company, of Pawtucket, R. I., report recent sales of the Wood safety gates for passenger car platforms, as follows: New York, New Haven & Hartford, fourth lot of 400 gates; Osgood, Bradley & Sons, 200 gates; Laconia Car Company, 100 gates.

The oil used in Dixon's Graphite Paint is guaranteed to be the best boiled linseed oil. Graphite paint is recommended for roofs, brickwork, iron structures and all places where a dark paint can be used, and also as a priming paint. Manufactured by the Jos. Dixon Crucible Company, Jersey City, N. J.

The Drake and Weirs Asphaltum Car Roofing has now been in use 12 years. One of the first roofs that was put on has recently been taken off and found to be in good condition. Pieces of this old roof can be had from the manufacturers in Cleveland. They guarantee the life of their roof to be at least ten years.

The American Continuous Draw Bar Company have been doing a very large business during the past three months Their device was placed upon upward of three thousand cars. Among their more recent orders were drawbars for 1,000 C., C., C. & St. L. cars, and for 550 cars of the Louisville, New Albany & Chicago.

Playing Cards.

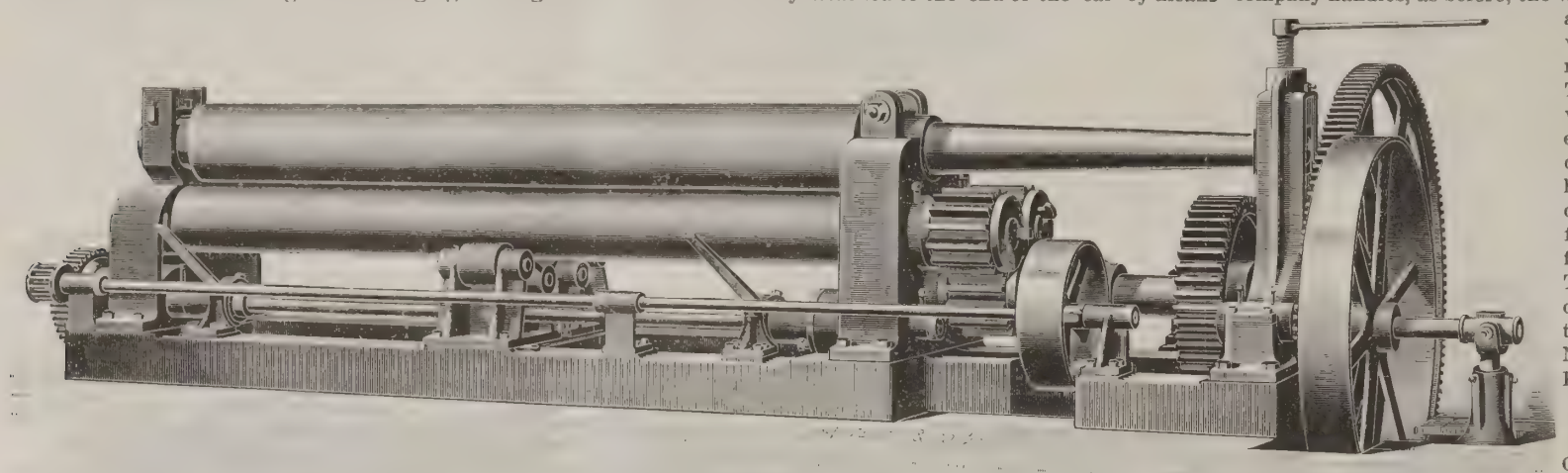
You can obtain a pack of best quality playing cards by sending fifteen cents in postage to P. S. Eustis, Gen'l Pass. Agt., C., B. & Q. R. R., Chicago, Ill.

Power Bending Rolls.

We present herewith an illustration of a new plate bending machine as designed and built by the Niles Tool Works, the well known manufacturers of machine tools at Hamilton, O.

This machine has found particular favor among railroad men and boiler manufacturers. It has a capacity of bending iron or steel plates up to ¾-inch in thickness and is usually built to accommodate plates from 10 to 12 feet in width.

The rolls are solid wrought iron forgings arranged in



"pyramid" form, the lower rolls being geared together. The upper or bending roll is adjustable by power to suit the thickness of plate and the radius to which it is to be bent. It has a movable bearing at one end and projects beyond the housing at the other in the form of a taper arm. Provision is made for depressing the extreme end of this arm by means of the screw shown in illustration, thus raising the opposite end and permitting the removal of a ring or flue. This feature are found of special convenience and advantage in boiler and other shops where plates are bent to complete circles.

Midway between the housings the lower rolls are given additional stiffness by a gang of supporting rollers. The machine is firmly tied together by a heavy cast iron sole plate. All gearing is accurately cut from the solid and all parts are made exceptionally stiff and substantial.

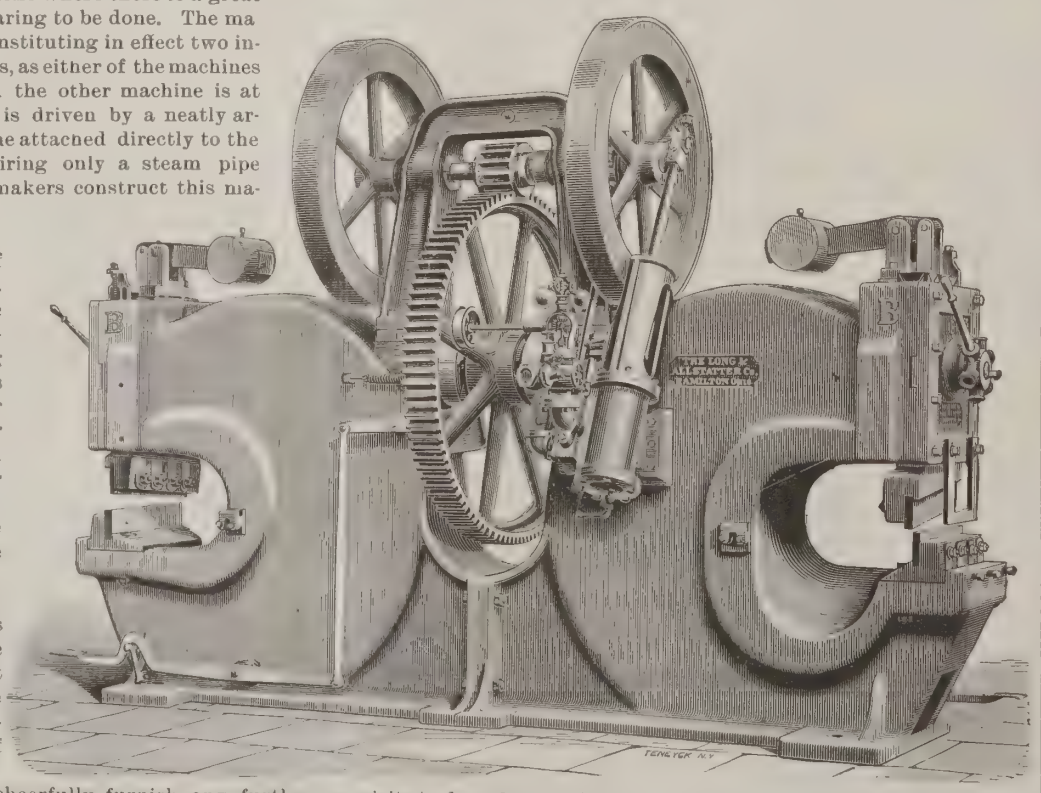
Suitable levers and clutches are conveniently placed for the quick and easy control of the machine's operations.

The illustration represents this machine as arranged for belt driving power, although the design comprehends the substitution of a pair of reversing engines for driving the machine, and it is so made when desired. When the engines are used, the sole plate is extended to form a base to receive them, and the whole then represents one solid rigid machine.

The Boston Belting Company have now in use by the different railroads throughout the United States upward of 3,000,000 feet of their Excelsior air brake hose. This hose is made with seamless tubes, and on special duck. Each piece is branded with their trade mark. They manufacture a full line of rubber goods suitable for railroad use.

A Double Shearing Machine.

The machine shown in our illustration, a production of the well known Long & Allstatter Co., of Hamilton, O., is designed for situations where there is a great deal of heavy shearing to be done. The machine is double, constituting in effect two independent machines, as either of the machines may operate when the other machine is at rest. The machine is driven by a neatly arranged steam engine attached directly to the machine and requiring only a steam pipe connection. The makers construct this machine in many different sizes, with different depths of throat, the particular size of machine shown in the illustration having blades 24 inches long, and power and strength for shearing 1-inch plates 24 inches or less from the edge. The slides are driven through the medium of steel cam-shafts, and these cam-shafts are arranged to be turned by hand at the front of the machine to facilitate the setting of the shear blades.



The makers will cheerfully furnish any further requisite information regarding this machine, or regarding modifications of it.

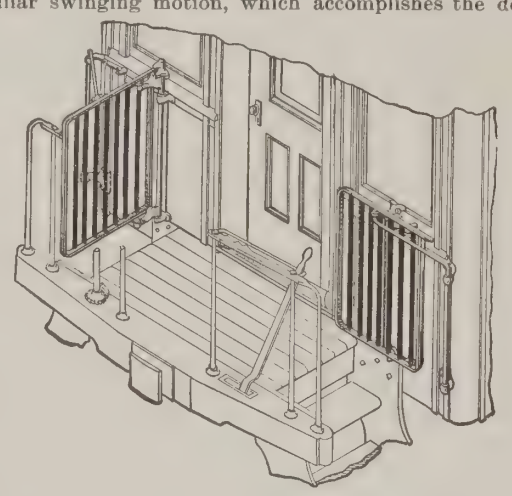
The Turnbuckle shop of the Central Iron and Steel Company, of Brazil, Ind., that was burned down in October last was rebuilt and put in working order the following December, 45 days after the fire. They are making more turnbuckles now than ever before, and doing a very large business, their output having been more than doubled during the past year.

Wood's Car Platform Gate.

With this issue we show the accompanying illustration of the Wood Car Platform Gate, manufactured by the R. Bliss Manufacturing Company, Pawtucket, R. I., and introduced by J. B. Goodwin, sole agent, No. 29 Broadway, N. Y.

The device is composed of few parts, is simple in detail, constructed on the interchangeable system, and presents a new and good solution of the problem of a safety gate.

As will be observed, a swinging post with arms at top and bottom is securely attached to the end of the car by means of a pivoting piece at the bottom and a collar above. The pivoting piece and the collar are securely held in place with screws to the sill below and the framing of the car above. The gate proper is hinged or pivoted to the post (top and bottom) at a given point on the gate end and to the outer point of the arms. By pivoting at these points is secured a peculiar swinging motion, which accomplishes the double



purpose of permitting the gate when in use to be placed in position directly across and parallel to the car platform, and when not in use to be swung back, occupying a space which is unavailable for other purposes and without interference with any existing condition of platform, step, brake staff, or coupling lever.

Attached and pivoted to the gate is a "grab iron brace bar" which extends to and is pivoted to the outer corner of the car by means of pivoting pieces which are securely fastened to the framing with screws. The "grab iron brace bar," when the gate is in use, securely holds the same in position, serves as a hand rail, and is an important factor in holding the gate in place when it is folded back. Particular attention is due to the fastening of the gate when opened or closed, which is secured by one double acting latch attached to top of post, as shown in cut. No fastenings are required on the buffer beam end of gate or platform, thus permitting of an adjustment to all widths of openings.

To operate the gate, the latch is turned, the gate swung, when it will automatically lock itself in the opposite position and vice versa. The standard gate is made strong and simple in design, as shown in cut, and is adjustable to all cars and widths of car platforms.

In this simple but effective device is secured a practical safety gate that fulfills the requirements for which it is designed. A large number have been placed during the season of 1891, and in every case are giving good satisfaction.

The Drexel Car Coupler Company, of Chicago, has been merged into the Drexel Railway Supply Company. This company handles, as before, the well known Drexel coupler, also the Drexel journal box, which has been illustrated recently in these columns. This lid has been received with marked favor, as is evidenced by the fact that during the short time it has been on the market orders have been received for between thirty and forty thousand of them. This company has recently opened an Eastern office in the Columbia Building, New York City, with M. A. Kilvert as manager.

The American Steel Wheel Company, of New York, will move its works from South Boston to New Jersey, where they will erect a large steel foundry to meet the constantly increasing demands for their product.

In addition to the manufacture of car wheels and locomotive driving wheels and centers they are making solid steel spoke engine truck wheels, 28 inches, 30 inches and 33 inches in diameter, with a tire 2½ inches in thickness, with which some 50 locomotives have been equipped within the last 60 days. With the increased weight of engines these wheels are rapidly growing in favor, owing to their very superior strength.

The McSherry Manufacturing Company, of Dayton, O., is very busy in all the departments of its large factory. In addition to Agricultural Machinery, they make the Maxon lifting jacks, which are so largely used by railroad companies and others. Owing to the death of Mr. McSherry a change has been made in the officers; the new Secretary, Mr. Edward C. Boyer, has been actively identified with the company for the last ten years, he has had a thorough experience in all the departments of the company's business. He is the inventor of a number of improvements made in the implements manufactured by the company. Mr. J. B. Nugent has been appointed general agent; Mr. Chas. B. Oglesby, of Middletown, is President; Mr. Louis Sebald also of Middletown, is Treasurer, and Mr. Paul J. Lorg, Vice-President.

Our Directory.

Allegheney and Kinzua.—C. V. Merrick has been appointed Superintendent, vice C. D. Williams, resigned.

Atchison, Topeka & Santa Fe.—J. Conroe has been appointed Master Mechanic at La Junta, Colo., vice L. H. Waugh. W. E. Symons has been appointed Master Mechanic at Raton, N. Mex., vice W. H. Traver. J. Kirk has been appointed Master Mechanic at Arkansas City, Kan., vice J. M. Emery. H. C. Ives has been appointed Division Superintendent.

Boston & Maine.—D. W. Sanborn has been appointed General Superintendent, with office at Boston, Mass. C. L. Aiken has been appointed Division Master Mechanic, vice A. R. Barrett, promoted.

Central Vermont—F. W. Baldwin has been appointed General Superintendent, with office at St. Albans, Vt.

Chattanooga Southern—F. S. Wallace has been appointed Superintendent.

Chicago & Alton—J. H. Ruxton has been appointed Division Master Mechanic, vice E. J. Whitington, resigned.

Chicago & Eastern Illinois—M. J. Carpenter has been appointed Purchasing Agent, vice A. D. Evans, resigned.

Chicago, Rock Island & Pacific—A. Child has been appointed Division Master Car Builder.

Cincinnati, Wabash & Michigan.—N. P. Ramsey, General Manager, will resign on April 1, 1892.

Lehigh Valley.—E. Van Etton has been appointed Superintendent of Western Division.

Louisville, Evansville & St. Louis Air Line.—G. Evans, General Manager, has resigned.

Newport News & Mississippi Valley.—W. E. Morse has been appointed Superintendent of the Western Division, headquarters at Paducah, Ky.

New York, Lake Erie & Western.—R. Kells, Superintendent of Motive Power, died early in the morning of March 10, 1892.

New York & New England.—C. Parsons has been chosen President, to succeed A. Corbin.

Ohio & Big Sandy.—E. Randolph has been appointed Superintendent. Headquarters at Lexington, Ky.

Santa Fe Southern.—T. J. Helm, heretofore General Superintendent, has been made General Manager, vice L. M. Meily retired.

Silver Lake.—C. A. Carmichael is Superintendent of this road, with office at Perry, N. Y.

West Virginia & Pittsburgh.—E. W. S. Moore has been appointed Purchasing Agent, vice P. J. Seaver, resigned.

Wisconsin Central.—W. G. Pearce has been appointed Purchasing Agent, vice C. C. McLeod, assigned to other duties.

Wanted.

Car painter, first-class workman, desires good situation. Competent to take charge of shop. Address Sutherland, 230½ Seventh Street, Jersey City, N. J.

NATIONAL CAR AND LOCOMOTIVE BUILDER

MAY, 1892.

CONTENTS.

Jay Gould isn't a cowboy, but he's watered a good deal of stock in his time.

The Baltimore & Ohio contemplates putting up a 26-stall roundhouse at Brenwood, W. Va.

The Schenectady Locomotive Works are building ten 10-wheel locomotives for the Chicago & Alton.

Mexican railroads are taking united action with the view of adopting a national standard of time.

The Great Northern has placed an order for 50 consolidation locomotives with the Brooks Locomotive Works.

The Schenectady Locomotive Works are building 27 compound locomotives for the Southern Pacific Company.

The Baldwin Locomotive Works have completed and shipped two more engines for the Jaffa & Jerusalem Railroad.

The Chicago, Burlington & Quincy is in the market for 2,000 freight cars to be equipped with all modern improvements.

The Chicago, Burlington & Quincy has ordered 25 10-wheel engines and 25 mogul class H engines of the Rogers Locomotive Works ; all to be simple engines.

The C. C. C. & St. L. has ordered 30 locomotives of the Richmond Locomotive Works, 10 of the Brooks Locomotive Works, and 10 of the Schenectady Locomotive Works.

The New York & Boston Inland Railroad Company was organized in New York, April 21, with a capital stock of $10,000,000. The principal office is to be at Middletown, Conn.

A new trainshed is to be built at the Illinois Central R. R. terminus at New Orleans, La. It will be 500 feet long and 175 feet wide, covering nine tracks, and is to be completed by July.

The Hall automatic block-signal is to be used on the New York Central freight tracks between Albany and Buffalo; and on the Illinois Central tracks between Chicago and Kensington.

The Chicago, Milwaukee & St Paul has built a dynamometer car modeled after the one on the C. B. & Q. Several new devices are added, among which is one for registering the strokes of the air pump.

The boiler of a switch engine on the Missouri, Kansas & Texas Railway exploded April 3, while the engine was standing on the track at Colmesneil, Tex. Nobody was near the engine at the time.

E. T. Kintzel, a locomotive engineer of the Northern Pacific system of Helena, Mont., is the patentee of a device for purifying the feed-water for locomotive boilers, which is now being tested on that road.

A railroad men's club is to be organized, to include master mechanics, master car-builders, road foremen of engines, trainmasters and assistant trainmasters, making headquarters in Pittsburgh or Allegheny.

The Baltimore & Ohio railroad is establishing a complete system of standards over its entire system for all its standard classified locomotives, tenders, etc. A complete set of templates and detail drawings are furnished to each shop.

The Chicago, Burlington & Quincy are to build large paint shops at Aurora to replace those burned in 1888. The buildings will have two fire walls, will be flat roofed, heated by the Sturtevant hot air system and will contain 11 tracks.

Mr. Von Borries states in a recent article that the number of compound locomotives in use and being built increased during the year ending Nov. 1, 1891, from 1,034 to 1,358, and that in Russia alone the number had increased from 32 to 155.

Some very valuable machinery has been destroyed by a fire which occurred at the Crewe railway works in England recently. Three large shops were completely gutted and several firemen had marvelous escapes. The damage is estimated at $250,000.

A locomotive boiler explosion occurred on the Long Island Railroad, near Long Island City, N. Y., April 6, killing three men. The engine was pulling a train of flat cars, and the fireman was shoveling coal into the firebox when the explosion took place.

The Chicago & South Side Rapid Transit Company, the builder of the "Alley" road, has been granted by the Chicago City Council an ordinance giving permission to construct a similar line on the west side of the city and to extend the present line southward to Jackson Park.

An ordinance was introduced in the City Council of Philadelphia lately "to suppress the dense clouds of smoke emitted by the Pennsylvania Railroad locomotives in West Philadelphia." Possibly the company can be induced to use anthracite coal now that the rates have been reduced.

Mr. L. S. Coffin, representing the Brotherhood of Railroad Trainmen, appeared at Washington recently before the Senate Committee on the Columbian Exposition. He stated that his constituents intended to request Congress to pass a law prohibiting the running of interstate mail trains on Sunday.

A locomotive boiler explosion occurred on the Illinois Central Railroad at Chicago, April 5. The engine was hauling a train from Harvey and was passing Seventy-ninth Street when the accident occurred, the cause being the giving way of the crown sheet. The engineman and fireman were seriously injured.

A bill has been introduced in the Iowa Legislature making it unlawful to employ any man as a locomotive engineer who has not previously served three years as a locomotive fireman ; and providing that no engineer must be employed on a passenger train who has not had at least one year's experience in road service.

Several steel burglar-proof express cars are being built at the Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway for the use of the American Express Company. They will be 50 feet long by 8 feet wide, with an inside steel room for valuable express matter, and, inside of that, a strong safe built into the car.

A spark from a passing locomotive set fire, on the morning of April 10, to the roof of the car shops of the Philadelphia & Reading Railroad Company, at Wayne Junction. on the outskirts of Philadelphia. The structure, together with 80 box cars, valued at $400 each, was entirely destroyed, the total loss being about $60,000.

The Lafayette car works, of Lafayette, Ind., was sold recently to a Lafayette syndicate for $39,500. The bidding started off at $15,000, but President Ingalls, of the Big Four railway, ran the figures up to $39,000. Some months ago the car works went into the hands of a receiver and the sale was under orders of the Federal Court.

A recent creation of the Pullman company is a dining car finished in delicately carved rosewood. Great baronial chairs with high backs and Japanese embossed leather cushions take the place of the seats now used, and the car is lighted by seventy-five incandescent lamps in crystal bulbs. The new car was designed for the Pennsylvania road.

The St. Charles Car Company is building five elegant 60-foot chair cars for the M., K. & T. They are to have six-wheel trucks and mahogany finish. This company is also building 15 chair cars for the St. Louis and San Francisco, to have mahogany finish and be models of beauty and comfort. They are to have Scarritt's latest twin reclining chair.

While passing a brick foundry at Shamokin, Pa., a truck on one of the cars of a Lehigh Valley freight train left the track, and the car, followed by twelve others, dashed through the wall of the building. Cars and building were wrecked, the loss in the foundry, chiefly through the destruction of valuable castings, being estimated at $8,000.

The Baltimore & Ohio has begun improvements on its Western lines in order to afford increased facilities for World's Fair traffic. The equipment for largely increased passenger business and an extensive stock of freight cars have been ordered. The Western roads of the system will be improved by straightened lines, reduced grades, extra side-tracks and interlocking switches.

The Chicago, Burlington & Quincy is going to change the practice of having the names of the different roads comprising that system appear on their passenger cars, as "Chicago, Burlington & Quincy," "Hannibal & St. Joseph," "Burlington & Missouri River in Nebraska," etc., etc., and substitute the name "Burlington." The names of the proprietary roads to which the coaches belong will be stenciled on the trucks.

On April 5 a miniature cyclone swept over the World's Fair grounds and caused a damage of $30,000 to the various structures. The greatest damage was done to the Illinois State Building, the dome of which was blown down, and a brick power house in process of construction was also razed to the ground. The remaining buildings, all in the process of construction, withstood the heavy wind without any evidence of weakness.

A remarkable piece of engineering work is the tunnel of the Parana Oroya Railroad through an Andean mountain peak at Galera, Peru. It is at an elevation of 600 feet above the perpetual snow line, and is to be 3,847 feet long. It is the highest railroad tunnel in the world and is located in the highest inhabited region in the world. The town of Galera is 15,365 feet above the sea level, nearly 1 500 feet higher than the hotel on the top of Pike's Peak.

A severe and widespread rainstorm did a good deal of damage in several Southern states in the early part of April, a considerable number of people being drowned. It was reported on April 8 that five bridges on the Georgia Pacific had been destroyed by the floods. The train service of the Louisville & Nashville was very seriously interrupted, long stretches of track being under water for several days. The Illinois Central suffered seriously.

The members of the Train Dispatchers of America will hold their regular annual convention at New Orleans on the 14th of next June. The members of the association in the North and Northwest will all congregate at Chicago and leave that city for New Orleans, Sunday evening, June 12, in a vestibuled train tendered free of charge by the Illinois Central to the dispatchers and their friends, and will be at their disposal until the convention closes its work.

John Goodall, aged 35 years, an evangelist, of Great Gate, near Alton Towers, England, was found guilty on March 29 of attacking Mrs. Mary A. Siddals in a compartment of a car on a Midland train near Tamworth, on the night of Jan. 11, mentioned in these columns. He was sentenced to two years imprisonment at hard labor. This case has excited considerable discussion in England regarding the compartment system in use on English railroads.

The Pennsylvania Company expects to handle a great many more passengers during the World's Fair in Chicago than its ordinary passenger equipment will accommodate. To provide for the emergency it is proposed to construct a large number of cheap excursion cars, which can be disposed of with as little loss to the company after the Fair as possible. In 1876 the company made a mistake in building a large number of cheap passenger coaches, which could only be utilized on the branch lines and were of no practical value.

The Illinois Central car shops at Chicago are building several hundred open cars for the use of visitors to the Exposition. The car is designed to seat 110 persons comfortably, although at least 24 more average sized persons may be accommodated with seats. The length of the vehicle over all is 53 feet and from sill to sill 45 feet and one inch. The width is eight feet inside and the height from rail to roof 13 feet 9¼ inches. Across the ends of the car are seats, and there are, in the interior, ten double-seated compartments. No steps or platform will be attached to the car as the train will make no stops between Van Buren street and the Exposition grounds and the platforms at the terminals will be of the same height as the floor of the cars. In finish the coaches will be of the same style as the suburban cars.

When passenger train No. 2 on the Illinois Central road, northbound, reached Hammond, a station 60 miles north of New Orleans, April 15, a man boarded the engine and thrust a pair of revolvers into the faces of the engineer and fireman. The engineer was ordered to reverse the engine at Newsum Mills, about 77 miles from the city. The engineer and the fireman were then used by the robbers as a parleying party, and were instructed to go to the express car and to order the messenger to open his car. An entrance into the car was there effected. The safe was emptied of its contents. Having completed their work the robbers disappeared in the darkness, leaving the mails and the passengers undisturbed. The superintendent of the express company said that the amount carried off by the train robbers would hardly exceed $3,000.

In the paint shop of the Chicago, Burlington & Northern coaches coming in off the road are cleaned by the use of oxalic acid. The solution is made as strong as can be dissolved. It will not remove grease unless such grease is upon a coating of dirt, between which and the paint the acid can penetrate. Using this acid does not in any way injure the paint. This has been proved by more than a year of experience with it and by testing it repeatedly in the shop by the use of panels, which were washed frequently without resulting in any damage whatever to the paint. The only care necessary to be exercised in its use is not to allow it to dry upon the car. Where it dries the surface will appear streaked, and it will be impossible to get this off. Before the acid is dry it should be washed off with clean water. An immense amount of time and labor is saved by this process and it was the necessity for keeping all of the equipment on the road as much of the time as possible that first led to its use by this road.—*Railway Master Mechanic.*

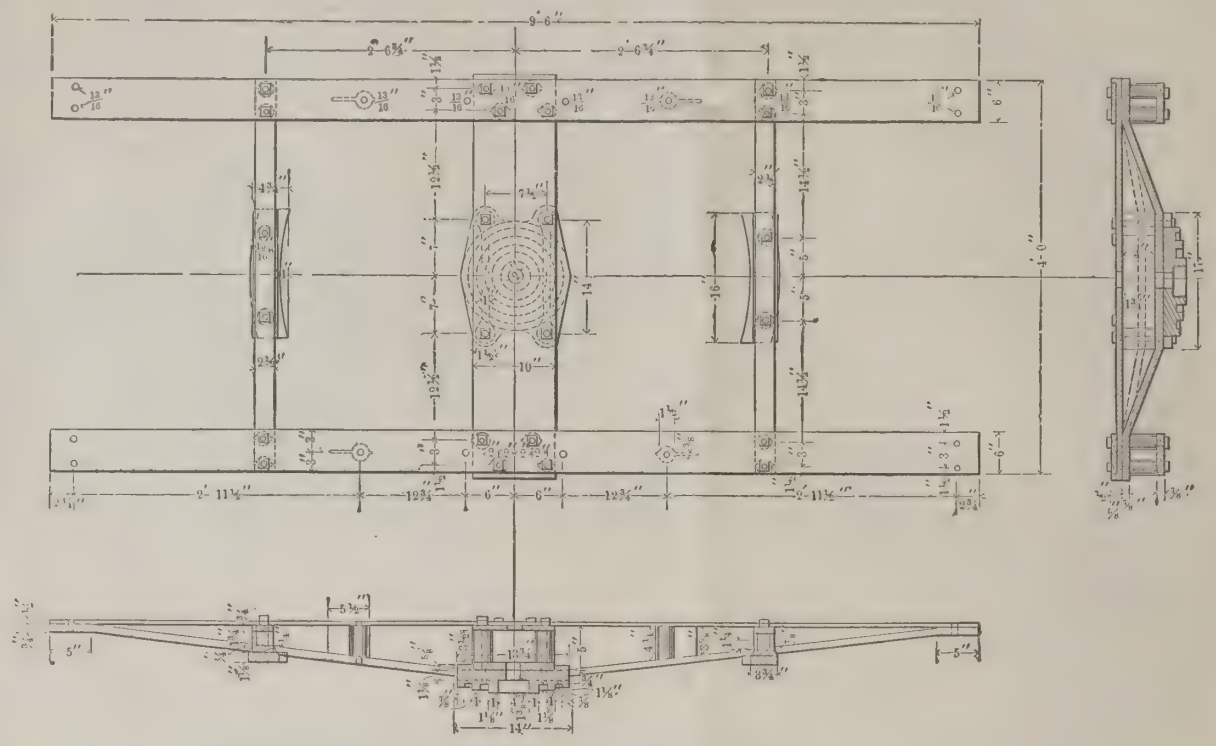
Passenger Car, New York Central & Hudson River Railroad.

The N. Y. C. & H. R. R. R. standard passenger car, illustrated herewith in detail, is 54 feet long and 9 feet 6 inches wide, measuring in both cases over the sills; the distance from the top of the sills to the bottom of the plate is 6 feet 6 inches. The extreme dimensions are: Length, 61 feet over the buffers; width, 9 feet 10½ inches over the eaves; height, 13 feet 11 inches from the rail to the top of the deck; to the latter dimension the projecting lamp-jacks, etc., must be added.

The floor frame is constructed with 5 inch × 8 inch side sills, 4½ inch × 7½ inch stringers and 6 inch × 8 inch end sills. The former are of Georgia pine and the latter of white oak. An improvement in the construction recently adopted is not shown on the framing plan but is indicated on the platform drawing. It consists of the strengthening of the side and end sills by the addition of wrought iron plates. Those applied to the side sills are ¼ inch × 8 inches × 16 feet long and are placed between the side sills proper and a piece of 2½ inch × 8 inch Georgia pine, the whole being securely bolted together. The ends of these plates are turned at right angles where they meet the end sills, thus taking the place of the corner brackets formerly employed. The end sill consists of two pieces of oak, each being 3⅝ inches × 8 inches in size, and an intervening ¾ inch × 8 inch plate; the inner piece is framed to the longitudinals with mortises and tenons in the usual manner.

The distance between the center sills is 7 inches and that between these and the intermediate is 8½ inches. All the sills are framed flush with their lower edges and the side and end sills are rabbited to receive the under floor. The latter is laid with joints across the frame; the floor proper is applied lengthwise. In addition to the above there is a ceiling floor secured to the under side of the floor frame and with joints running in the same direction as those of the under floor. An intermediate floor is cut in between the sills at a distance of 3½ inches from the top edges of these and is held in position by 1 inch × 1½-inch cleats secured to the sides of the sills. The floor proper is of quarter-sawed Georgia pine 13/16 inch × 2¾ inches. The other floors are ⅞ inch thick, and the boards composing them not more than 8 inches wide. All the floor boards are tongued and grooved.

The body bolsters are of the double variety. The tension bars are ½ inch × 6 inches, the compression bars ¾ inch × 6 inches and the distance between them 5 inches at the center. The body center plate is attached to an iron truss which is formed with ⅝ inch and ⅞ inch × 10 inch bars and the side bearings to similar trusses of ⅝ inches and ⅞ inches × 2½ inch bars. These trusses are attached to the bolster bars, which are placed 3 feet 6 inches from centers and so located that the distance from the face of the end sill to the center plate is 6 feet 6⅝ inches. The construction of the bolster, etc., is shown in detail. There are four cross-ties each of 3½ inches × 6½ inches white oak, and each trussed with a ¾-inch rod in the usual manner. The two principal ties are placed 10 feet apart and are supported by 1½ inches body truss rods of which there are two and which are by means of pin connections attached to suitable forgings bolted to the under edges of the side sills in the neighborhood of the bolsters or transoms. The second pair of cross-ties are placed 6 feet 8 inches distant from the former and simply serve as ties.



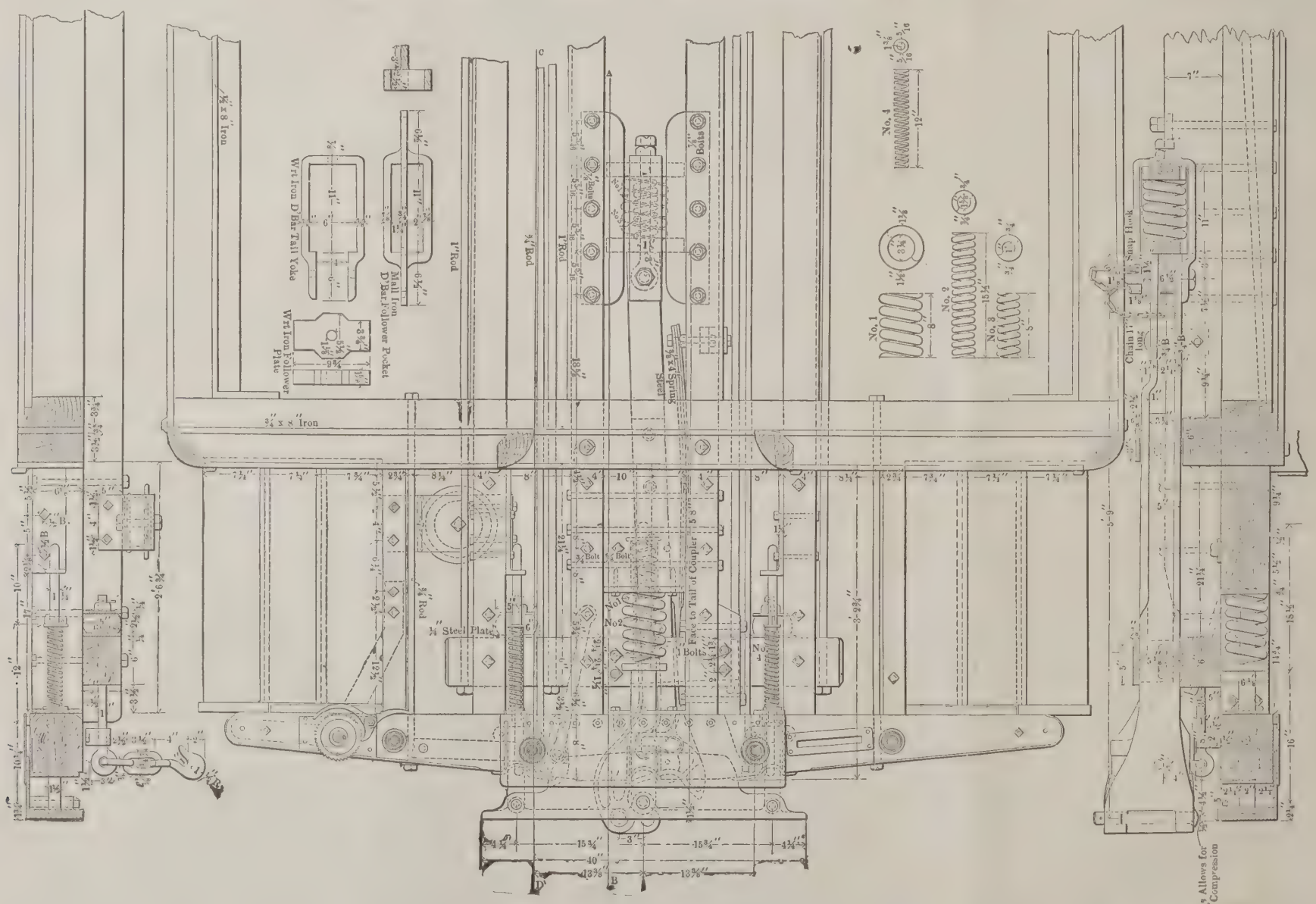
PLAN OF BODY BOLSTERS AND SECTION THROUGH CENTER.

Framed in between the sills at intervals varying from 16 to 21 inches are 1⅜ inch × 7½ inch distance pieces or bridging of Georgia pine, and at every other one of these a ⅝-inch tie rod. The general arrangement drawings show the car equipped with the Miller platform, coupler and buffer, but a change was lately made from this to the Gould coupler and buffer; the detail drawing herewith shows this, and as this drawing is very complete a detailed description is not necessary.

The side framing of the car is constructed with 2 inch × 5 inch plates, 1½ inch × 4 inch window and cripple posts, 1½ inch × 5½ inch belts, 1½ inch × 2 inch nailing rails and 1⅛ inch × 7½ inch braces; the plates and nailing rails are of Georgia pine, the posts and braces of white ash and the belt rails of white oak. The side frames are trussed with the usual A brace and a series of short hook braces. It will be noticed that the long truss rod, usually employed to hold up the corners of the car is omitted but all the spaces in the framing below the windows and at the toilet room end of the car, those above the belt rail also, are blocked with ⅜-inch white wood boards, which are nicely fitted and secured to the slightly rabbited posts with both glue and nails.

The end framing is similar to that at the sides, excepting that the end-plates are of ash and 2¾ inches × 18 inches in size. An additional improvement also recently made and which is not shown in any of the drawings, consists of a ⅜ inch × 6 inch curved iron plate bolted to the inner face of the end plate, and six ¾-inch × 3½ inch vertical plates, which latter are secured to the sides of the intermediate posts, and which by means of a half twist at each end engage below with the plate contained in the end sill and above with the plate just described. The object of this additional iron work in the ends is to offer more resistance to telescoping.

The exterior is covered with ⅝ inch × 3 inch matched white wood sheathing. This is worked with ⅛-inch semi-circular grooves at intervals of 1½ inches, and is attached



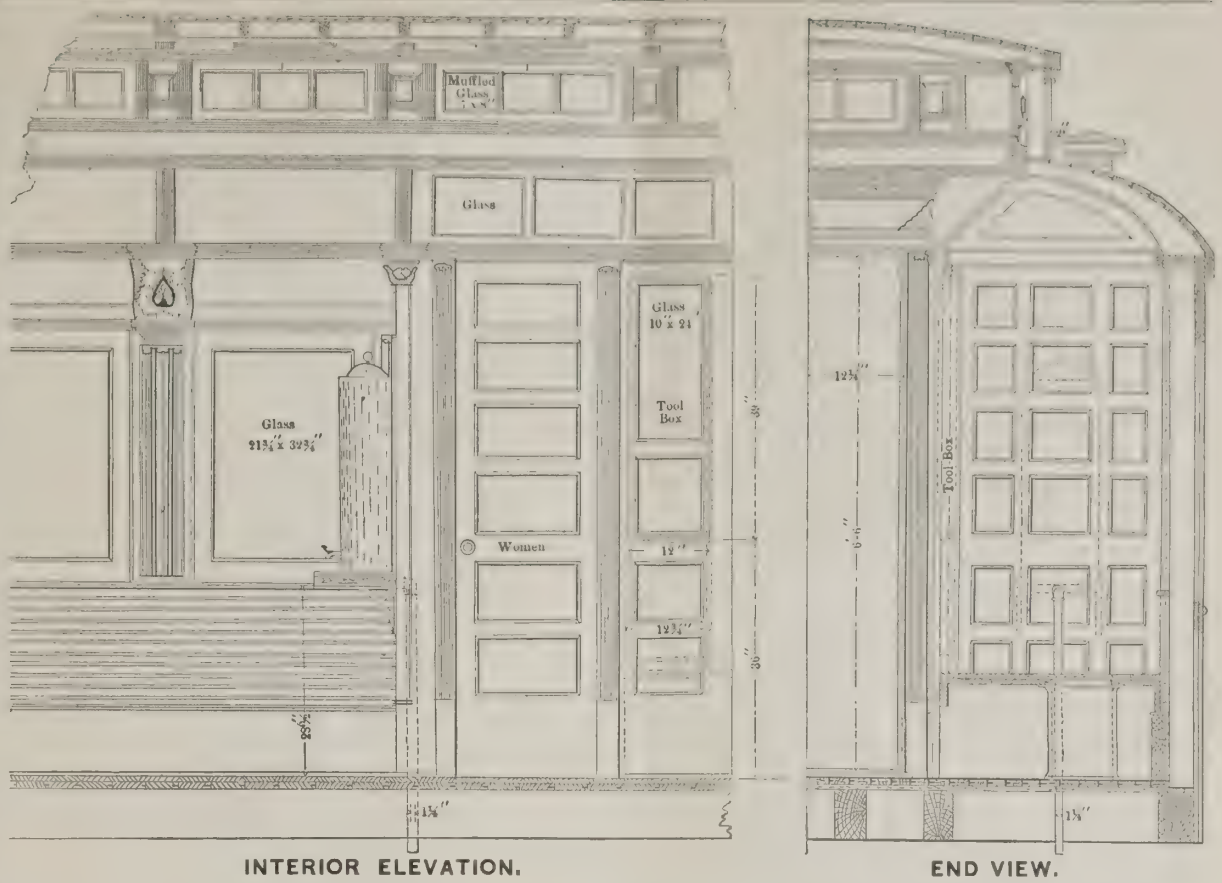
TOP AND SECTIONAL VIEW OF PLATFORM AND DRAFT GEAR.

with glue and wire nails, the blacked surface of the frame being first properly dressed and otherwise prepared to receive it. The corner and door posts are also of yellow poplar; the former being worked to a radius of 5½ inches, and the latter to that of 4¾ inches. The door arches and sills are of cast iron. The letter boards are 1½ inches by 11½ inches, and the material yellow poplar, as is also that used for crown and fascia moldings, window stools, etc.

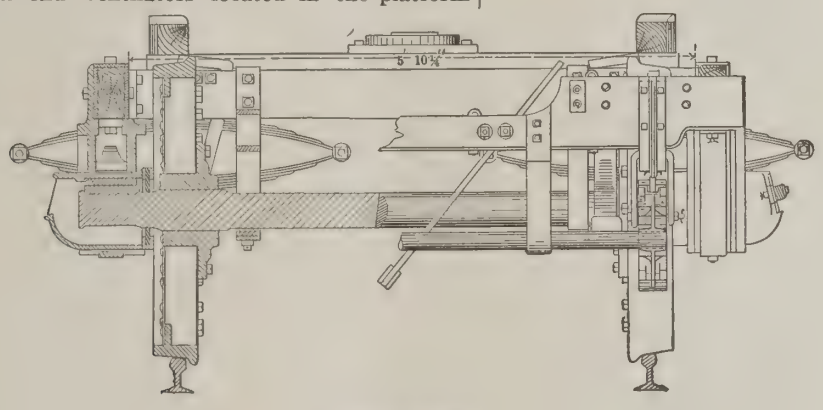
The roof is constructed with 2½-inch by 5½-inch deck sills, 2-inch by 3¼-inch deck plates, both of Norway pine, and 1⅝-inch ash rafters. The platform roofs are of yellow poplar, excepting the end carlines, which are of ash. The roof boards are ⅞-inch by 3½-inch matched white pine, secured by wire nails. The covering is No. 26 BB galvanized iron, the plates lapping one inch, and being fastened with ⅞-inch barbed wire nails, which are applied at intervals of two inches. There are, in addition, three screws in the middle of each sheet, and all the laps and nail and screw heads are well covered with solder.

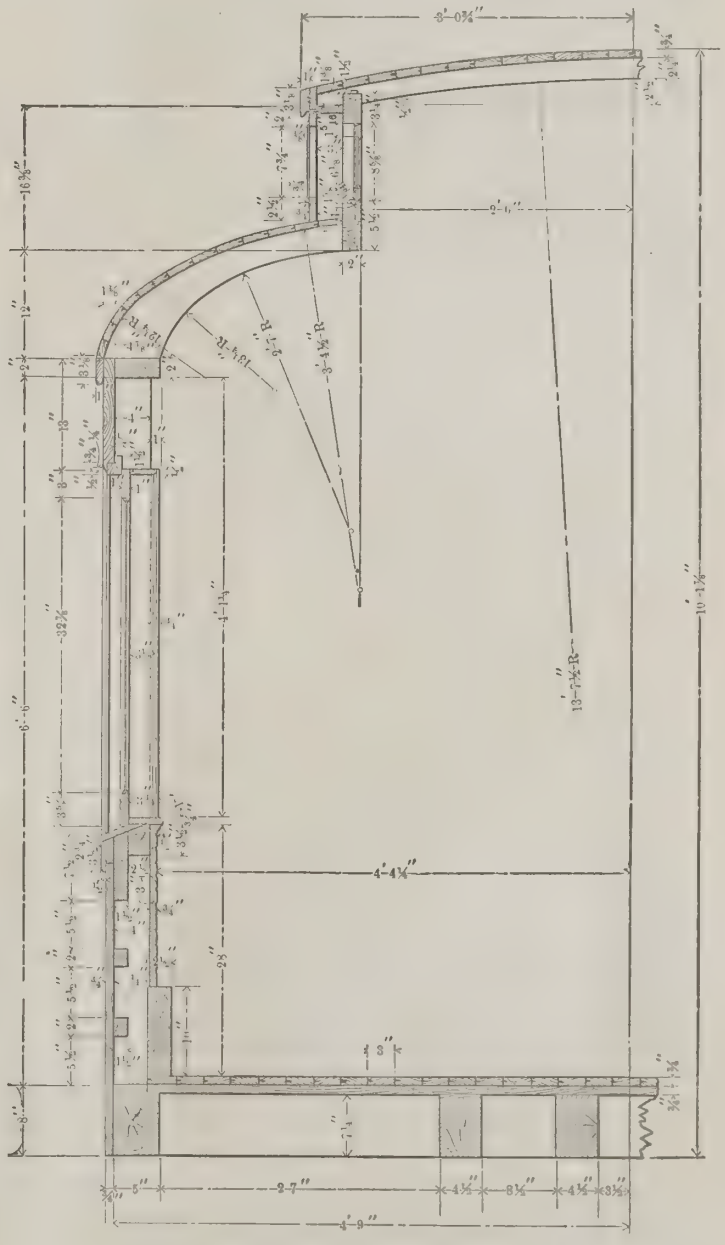
The interior of the car is finished in mahogany throughout, excepting the ceiling, which is of oak veneer. The design of the woodwork is not very elaborate, but substantial, and the effect pleasing. The windows have single sash, which are also of mahogany; in place of the usual blinds the car is equipped with curtains, which are mounted on Hartshorn spring rollers. The window posts being sufficiently wide to afford ample space for the curtains, no unsightly boxes are required for these.

There are two toilet rooms, finished to correspond with the woodwork in the body of the car, and, contrary to the usual practice, both are located in the same end of the car. The seats are Hale & Kilburn's No. 73, and the trimmings are of bronze. Ventilation is provided for in the usual manner, that is, by movable deck sashes, which are hung with ratchet pivots, by drop sashes in the end doors, and by the additional end ventilators located in the platform hoods. The toilet rooms are provided with a 5-inch globe ventilator each.

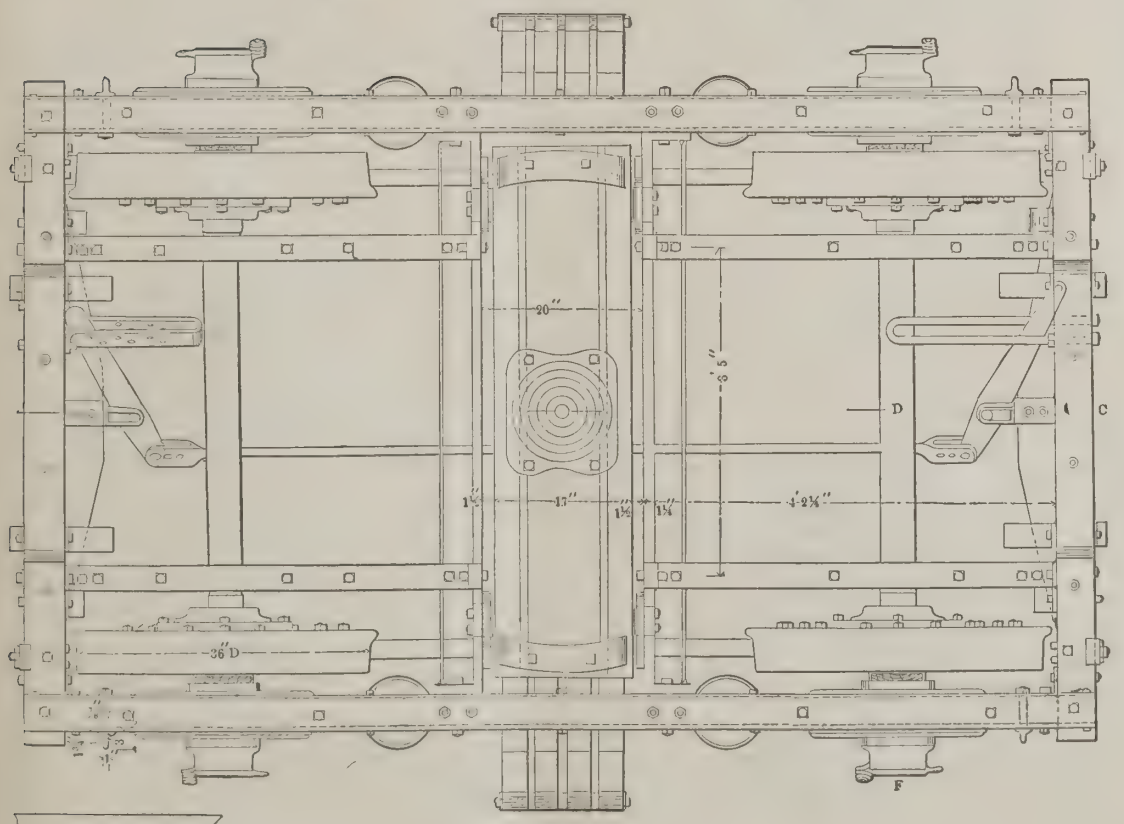


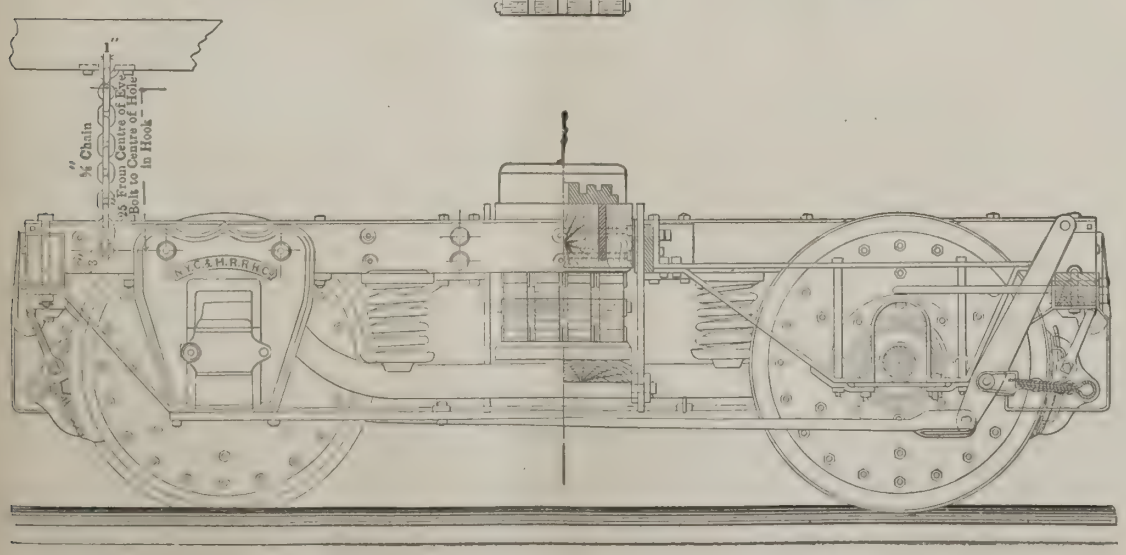
INTERIOR ELEVATION. END VIEW.





HALF SECTION THROUGH CENTER.





PASSENGER CAR, N. Y. C. & H. R. R. R.—TRUCK.

These cars are warmed by direct steam obtained from the locomotive, and are equipped with the Pintsch light, which has been adopted by this company. There are five 4-jet lamps in the body of the car and a 2-jet lamp on each platform, the latter being contained in a dome similar to that used for vestibuled cars.

The cars are mounted on four-wheeled trucks, having a 7-foot wheel base and steel-tired wheels. The trucks are constructed in the usual manner with plated wheel pieces, etc., and the only noticeable features are the iron transoms and axle safety beams; these members are usually of wood or a combination of wood and iron.

The cars are equipped with the Westinghouse quick action brake and air signal.

The Royal Mail Steamship Company has commenced issuing through tickets from Liverpool to Valparaiso via Buenos Ayres and the Trans-Andine Railroad. It announces the time between the two points as being only 23 days.

Coal Consumption of Locomotives.—II.

BY GEORGE H. BAKER.

(*Continued from page* 38.)

(Management.)

Q. 25. What is a unit of heat?

A. A unit of heat is an amount of heat that will warm a pound of water one degree of temperature. It is the established unit of measurement of heat. One hundred and eighty units of heat would warm 180 pounds of water one degree, or one pound 180°. That amount of heat would raise the temperature of a pound of ice cold water (32°) to the boiling point under atmospheric pressure (212°).

Q. 26. A unit of heat would be generated by the blow of a pound weight falling from what height?

A. 772 feet.

Q. 27. If all applied mechanically without loss it would lift a pound weight to what height?

A. To the same height, 772 feet. There has always been great losses of useful effect in the application of every means yet invented by man to convert the power of heat into useful work, but that the power exists and has been correctly measured there can be no doubt. It does not seem improbable that the blow of a pound weight falling against the earth from a height of 772 feet would generate an amount of heat sufficient to warm a pound (roughly a pint) of water one degree of temperature. But that this small amount of heat is capable of doing work equal to lifting the weight to the height from which it fell, or of lifting 772 pounds one foot high, or a man weighing 193 pounds four feet high, seems almost incredible.

But it is abundantly proved that this is true. As illustrating that a descending body will generate force enough by its fall to lift it back to its former height, take the action of a ball attached to a piece of India rubber. If the end of the rubber elastic furthest from the ball be held and the ball allowed to drop toward the ground, the stretched rubber will finally stop the descending motion of the ball and pull it back to nearly its former height. That the ball does not return to quite its former height is because some of the force its fall generated was expended in overcoming the resistance of the air it passed through, and some of the force was converted into heat and warmed the stretched rubber.

A train of cars in descending a steep hill will acquire force or momentum enough to cause it to run a considerable ways up another hill equally steep, rising from the bottom of the hill descended. And if it were not for the resistance made to its motion by the friction of the journals in their boxes, of the rubbing surfaces, of the wheels against the rails, and of the air passed through, the train would ascend the opposite hill to quite its former height.

Q. 28. How does water compare with other substances in its power to absorb heat?

A. Water is the most powerful absorber of heat of all solid or liquid substances. In fact water is to heat what a sponge is to water; it will soak up and hold more of it than will any other solid or liquid substance.

Q. 29. A unit of heat imparted to water represents how much work put into the water?

A. Seven hundred and seventy-two foot pounds of work.

It may appear that these matters have no relation to running locomotives, but the fact is they have a very important relation to the economical operating of the same, and they have been enlarged upon so as to make the fact impressive that heat is what makes locomotives go, and as heat is obtained for this purpose only by the combustion of expensive fuel—every unit of heat costs money. Therefore it is the duty of all connected with the operating of locomotives to guard against the waste of heat by any of the many ways such may occur, as, for instance, the imperfect combustion of coal for lack of a free supply of air to the fire; the use of more steam than is necessary in performing any work; the leaking of valves, pistons, or stuffing boxes; and the waste of steam through safety valves.

The power of water to soak up and hold heat is explained in order that it may be understood that when there is a surplus of steam, or heat, and it is about to be wasted through the safety valve, the water in the tender is capable of receiving and holding the surplus and preventing its waste, for whenever we put heat into water we really put *work* into it, or the capability of performing work, and every degree's increase of temperature is a step toward the point at which the water can be made to do useful work for us, as steam, in pushing the piston of our engine.

Q. 30. What is the atmospheric pressure?

A. At the sea level it is 14.7 pounds per square inch, commonly called 15 pounds.

Q. 31. In forming, what must a bubble of steam be able to resist?

A. The pressure above it, whatever that pressure is; whether it be the weight of the water, the weight of the air above the water, or the pressure of steam.

Q. 32. From what source must the bubble of steam get its strength or force to resist the pressure?

A. From heat.

Q. 33. Is steam of different pressures equally hot?

A. No.

Q. 34. How does the temperature vary?

A. The higher the pressure the hotter the steam, because the bubble of steam in forming must have strength (tension) to equalize or overcome the pressure above it. So it is evident that the greater the pressure the more strength or force the steam must have, and, as its only source of strength is heat, the more heat it has the hotter it must be.

Q. 35. Is boiling water under different pressures equally hot?

A. No.

Q. 36. How does the temperature vary?

A. The same as in the case of steam. The temperature of boiling water, and the steam arising from it and resting upon it, is always the same—both are equally hot. Boiling water under atmospheric pressure, 14.7 pounds per square inch, is 212° hot, and the steam of this pressure is likewise 212°. Boiling water under 145 pounds effective steam pressure per square inch is 365° hot, and the steam of this pressure is of the same temperature. In this case the temperature of the steam and water is 153° hotter, and the pressure of the steam is 145 pounds higher than in the case of boiling water under atmospheric pressure, showing a difference of temperature of a little over one degree for each pound difference of pressure.

As showing how absolutely the temperature of the boiling point depends upon the pressure it may be stated that water will boil in a vessel from which the air has been exhausted, so that there is no pressure upon the water, at 92°—six degrees below blood heat. At high altitudes, where the air is rare and its pressure much lighter than at sea level, it has been found impossible to properly cook some kinds of food simply because the water, on account of the light pressure upon it, would boil away without getting hot enough to cook the food.

This is an important point for engineers and firemen to remember. Every time the steam pressure in a boiler is allowed to vary, the whole temperature of the water, steam and metal of the boiler varies in accordance with the pressure, causing expansion or contraction, as the case may be, and resulting always in an injurious effect upon the whole construction of the boiler. This is why it is required that the steam pressure be kept within the limits of 10 pounds and not allowed to vary rapidly either way.

Q. 37. Of what advantage is a boiler full of water at the start?

A. It is an economical advantage.

Q. 38. Why?

A. Because a large quantity of heated water is really a great reserve force—a capital of heat—to a locomotive, which can be made to assist greatly in saving coal during all emergencies of hard work, such as starting trains from stations and struggling into speed.

If there is a good reserve of heated water in the boiler at such times the injection of water into the boiler may be suspended for a short time, often until the hard task of work is over.

When this is done a great saving occurs because the water in the boiler being already heated up to the boiling point, is possessed of 28 per cent. (under 145 pounds pressure) of the total heat it required to convert it into steam and the further communication of 72 per cent. of the total heat (the latent heat) is all that is necessary. This relief to the fire from having to furnish the other 28 per cent. of heat required *during the emergency of hard work* results in allowing such a less hot fire, and, therefore, improved combustion, that the economy resulting is out of all seeming proportion to the apparent cause. The truth is that we always have forced combustion in locomotive fireboxes, and the difference lies only in degrees of forcing the fire; and when the combustion is forced to generate sufficient heat to supply the total heat of the steam being generated and used during emergencies of hard work, it is so far beyond economical limits that an extravagantly large coal consumption takes place.

Q. 39. When is the best time to get water in the boiler?

A. Before the engine starts, while it is doing the easiest work, and while it is running shut off. Only, in the latter case, care must be taken to maintain the pressure, and therefore the temperature of the boiler.

Q. 40. How hot may the tank water properly be?

A. As hot as the injector will handle it, and not lose any water at the overflow. With most of the injectors in general use this is about 110 degrees, or unpleasantly warm for the hand.

Q. 41. What is the most economical way to use steam?

A. The most economical way to use steam is, at speeds of more than 12 miles per hour, with a wide open throttle and the shortest possible cut-off consistent with the work required.

With quadrants whose notches are spaced far apart this is not always practicable, but in using such quadrants it should be the *aim* to use steam at the shortest possible cut-off the work and the notches of the quadrant will allow, and make the engine do the work cutting off thus by pulling the throttle wide open. But with close notched or finely divided quadrants with which changing the position of the reverse lever one notch alters the length of admission of steam to the cylinders about one inch, the occasions are rare, with an engine doing normal work, but when a full throttle may be used to advantage and the cut-off regulated to just suit the work.

Q. 42. A slight opening of the throttle has what effect on steam?

A. It reduces the pressure of the steam flowing to the cylinders.

Q. 43. A full open throttle has what effect on steam?

A. A full open throttle allows the steam to flow to the cylinders at nearly the boiler pressure.

Q. 44. What are the advantages of using steam of high pressure and short cut-off?

A. Less steam is used to do a given amount of work; there is less back pressure in the cylinders; and the exhaust steam escaping from the cylinders at a lower pressure, with a short cut-off than with a late cut-off, gives a milder draft on the fire and this saves fuel in several ways. First, by causing slower and better combustion in the fire-box; second, by drawing less unconsumed fuel in the shape of sparks to the smoke-box or through the stack; third, by allowing a slower movement of the hot gases of the fire through the flues, allowing them to remain longer in contact with the same, and therefore giving more time for their heat to be absorbed by the water in the boiler.

Q. 45. How should trains be started and forced into speed?

A. They should be started as easily as possible, and not hurried into speed faster than is necessary to make the time. Locomotives always reciprocate favors shown them at such times by a reduced consumption of fuel.

Q. 46. What is friction?

A. Friction is a resisting force which always acts to retard or prevent the motion of bodies in contact.

Q. 47. In what does it result?

A. In all cases where motion is desired, friction results in a necessary increased expenditure of power sufficient to overcome it.

Q. 48. What are the objects of lubrication?

A. The objects of lubrication are to reduce friction, to prevent the wear of rubbing surfaces in contact and to save power. As our motive power all comes from the heat generated by the combustion of fuel, it is plain that one of the ultimate objects of lubrication is to save fuel. This is very important, and the consumption of fuel for motive power, in all cases, depends greatly upon the excellence of the lubrication of the rubbing or rolling surfaces of the engines, machinery, or objects to be moved.

The opinion is all too prevalent that the object of "oiling" is simply to "keep her from running hot." While the development of heat and consequent injury to the surfaces in contact is of the first importance, yet the saving in power effected by good lubrication is an important factor of economy. A lady oils her sewing machine not so much to "keep it from running hot," or wearing out, but, indeed, with little thought beyond the saving of personal effort—power—effected by the most perfect lubrication. Here economy of power, or personal effort, is the main object sought by lubrication, and in its accomplishment all the other objects of lubrication are most perfectly accomplished also.

Q. 49. How is lubrication accomplished?

A. By interposing between the surfaces a film of oil of sufficient body to keep them from coming together, so that the rubbing parts will not come into actual contact with each other.

Q. 50. What are the effects of heat on oil?

A. The effects of heat on oil are to cause it to become thin in consistency. This may become objectionable, and will when the oil becomes so thin that it will run off rapidly from the surfaces it is intended to lubricate, or when interposed between bearings where there is great pressure it may be forced from between them, or it may add undesirable heat to a cool bearing when it is warmer than about 80 degrees.

Q. 51. What are the effects of cold on oil?

A. The effects of cold on oil are to congeal it, and lessen its power of perfect lubrication. When it is used as a lubricant in a congealed state there is a considerable amount of friction in the oil itself, which acts nearly the same as the friction of solids, and retards motion, and makes necessary a greatly increased expenditure of power to overcome it. The increased resistance of trains in cold weather is chiefly due to this cause.

Q. 52. What treatment is best to cause oil to flow freely in cold weather?

A. The best treatment to cause lubricating oil to flow freely in cold weather is to dilute it sufficiently with some lighter and thinner oil so that it will keep of a liquid consistency *after* it is applied to the surface it is intended to lubricate. Preferably the oil employed for this dilution should commonly be kerosene, as it is much cheaper than signal oil, and is, itself, a very good lubricant for cold surfaces in cold weather. Pure kerosene is a better lubricant for ice cold surfaces than the best sperm oil.

According to *Engineering*, the first newspaper train was run in England Nov. 24, 1847, upon the adjournment of Parliament. The run from London to Beattock was accomplished in 9 hours and 12 minutes. In 1892 the same run is made in 8 hours and 59 minutes, an improvement of 13 minutes in 45 years. From Crewe a branch train was dispatched to Manchester, and reached that city at 10 o'clock, the hour the London papers now arrive there. The Liverpool parcel was sent on by a branch from Warrington, and arrived at 10:30. To-day it arrives at 10:25, but it travels via Runcorn bridge, which saves 11 miles over the old route.

Performance of Locomotive with Feed-Water Purifier.

Following is a report furnished us by Mr. C. F. Lape, Master Mechanic of the Middle Division of the Wabash Railroad, giving a record of the performance of engine No. 69, that was equipped with the Barnes feed-water purifier Feb. 18, 1890, and laid up for repairs March 31, 1892, on account of worn tires, after running over 92,000 miles. This was the first engine equipped with the Barnes purifier, and it certainly makes an excellent showing.

DATES OF BOILER WASHINGS.

1890.

Jan.	Feb'y.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days between washings.
		14 24	15			30			20 28	4 5 20	3 8	26 9 21 105 81 8 6 11 5 12 5

Total days..... 289
" times washed 11
Average days between washings.... 26
Mileage... 35,912
Miles per washing..... 3,265

DATES OF BOILER WASHINGS.

1891.

Jan.	Feb'y.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days between washings.
	14	18	20	22	3 30	18	4 27	1 28	12	9		66 32 33 33 12 26 18 17 22 4 27 14 18

Total days..... 332
" times washed..... 13
Average days between washings. 25½
Mileage..... 43,884
Miles per washing..... 3,376

DATES OF BOILER WASHINGS.

1892.

Jan.	Feb'y.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Days between washings.
	4	20										87 45

Total days..... 132
" times washed..... 2
Average days between washings... 66
Mileage..... 12,270
Miles per washing..... 6,135

Years.	Total days.	Times washed.	Average days bet. washings.	Mileage made.	Miles per one washing.
1890.	289	11	26	35,912	3,265
1891	332	13	25½	43,884	3,376
1892.....	132	2	66	12,270	6,135
Totals.	753	26	29	92,066	3,541

SPRINGFIELD, ILL.,
April, 18, 1892.

The condition of the boiler and flues when the engine was taken in the shop for repairs would have warranted six or seven months' additional service, but, owing to the fact that the engine was in the shop the flues were taken out. The crown sheet and crown bars were found to be apparently as clean then as when the engine first went into service. The boiler had about three bushels of fine scale such as is usual in boilers that have had five or six months' service. It is the practice on the Wabash when the water is let out of engines to do necessary work on the boiler or firebox, to wash the boiler out at that time to save holding the engine in at some future time for washing out. This explains why this engine was washed out at shorter intervals sometimes than at others.

The Chicago "Society for the Prevention of Smoke" have been making tests of several "smoke preventers" in use on locomotives, and among others recently tested a device used on 75 C., B. & Q. engines, known as the "Western Smoke Preventer." It is a steam jet device with a muffler for deadening the noise which is so objectionable with the general run of these devices. The officer of the society who conducted the experiments reported that the action of the apparatus used was sufficiently effective to prevent at least nine-tenths of the smoke and practically to prevent the engine from being classed under the ordinance as a nuisance. The means employed, as described, were very simple. Six columns of air, four at the back and two at the front of the fire-box, were driven into and above the fire by jets of steam, the result being a nearly complete mingling of the fire gases and the incoming air while the temperature of the air was considerably elevated by contact with the steam. The device is regarded as a very effective means of preventing smoke by those responsible for the operating of the locomotives to which it is applied.

Rapid Dining Car Building.

The Chicago, Burlington & Quincy car shops at Aurora are engaged upon an order for two vestibule dining cars of that company's standard. The time specified for their completion is sixty days, which we believe is an unparalleled short time for such a job.

The dimensions of these cars are:

Length out to out of sills.....	64 ft.
Width " " "	10 ft. 4 in.
Length face to face of drawbars.....	71 ft. 2 in.
" out to out of roof..... ...	69 ft. 10¼ in.
Width of roof.....	10 ft. 8¾ in.
" " clear story.	6 ft. 5¼ in.
Height of roof above rail.....	14 ft. 2⅛ in.
" " floor " " ....., ...	3 ft. 6⅛ in.
Wheel base.....	58 ft.
Dining room.....	9 ft. 7⅞ in. × 32 ft.
Seating capacity.....	30 persons.
Weight, body.....	56,000 lbs.
" trucks.....	31,000 lbs.
" total.....	87,000 lbs.

The order for these cars was given at the shops on Monday, March 28, and on Saturday, April 16, both cars received their first coat of color. There is little doubt but that the cars will be built within the specified time of sixty days.

Convention of Railroad Commissioners.

The fourth annual convention of the State Railway Commissions was held at Washington, April 13 and 14, at the rooms of the Interstate Commerce Commission. Reports of committees were presented on the following subjects: "Safety Appliances," "Uniformity in Railway Accounting," "Territorial Assignment of Statistics of Operation," "Railway Legislation," "Reasonable Rates," and "Discriminations Arising from the Use of Private Cars of Shippers." The report on safety appliances merely gave the statistics collected and the bills presented by the committee. The convention directed the committee to "urge upon Congress the immediate passage of such bills as may most effectively insure the equipment of freight cars throughout the country with uniform automatic couplers, and with train brakes, and the equipment of locomotives with driving wheel brakes."

The most interesting report presented was that on the evils arising from the use of private cars by shippers, prepared by Mr. John R. Wheeler, of the Illinois commission, The report reviewed the old "commission lines," the fast freight lines and car trusts, explaining how each of these devices operated to rob the railway for the benefit of private parties. As an example of the profits to be made from the successful working of a car trust, 2,000 cars costing $900,000, or $450 apiece, were rented to a railway company at $81 per year, the railway keeping the cars in repair. At the end of three years the cars were sold to the railway company for their original cost, less six per cent. for two years, amounting to $792,000, notwithstanding the fact that the railway company had already paid to the trust in the way of rentals more than half the cost of the cars when new. The amount received by the trust for rental during the three years was $486,000. Add to that sum the amount received from the sale of the cars and we have $1,278,000, from which deduct the original cost of the cars ($900,000) and there was a net profit of $378,000 to the trust. This profit, moreover, was made with practically no investment of capital, the rentals paid by the railway company being sufficient to meet the payments for the cars as they became due. The report then related how the use of private cars was forced upon the railways by such powerful corporations as the Standard Oil Company, and also by men who were directors of railway companies and at the same time interested in live stock or refrigerator car lines.

The discriminations resulting from the use of private cars are: 1. The mileage is excessive, enabling the recipient to use a portion of his receipts in this way as a rebate to secure shipments. 2. The special facilities afforded by private cars enable those using them to monopolize the market to the exclusion of small shippers. 3. The owners of such cars obtain annual passes for their officers. As an extreme example, a wholesale firm, owning a single car, appointed one of their number president, a second vice-president, and a third general manager of their one car, and obtained annual passes for the three.

More than 70,000 private cars are in use in the United States. The average car movement of the entire United States is estimated at 24 miles per day. If these private cars made only the same average mileage as other cars, and were paid for at the regular rate of ¾ cent per mile, they would yield $4,600,000 in the course of a year. The movement of these cars, however, averages at least double that of ordinary cars, and on a considerable number a higher mileage rate than the standard is paid.

From four of the larger systems of railways in the United States the following official statement has been obtained of the average daily movement of freight cars of various classes:

	Railway.				
Average daily mileage of:	A.	B.	C.	D.	Av.
Company's cars on company's lines.....	31	34	32	....	32.3
Company's cars on foreign lines.... ...	22	27	26	...	25.
Foreign cars of all classes on company's lines.....	44	63	38	....	48.3
Private refrigerator cars on company's lines.....	82	75	84	84.5	81.4
Private stock cars on company's lines..	93	80	77	77	81.7
All classes of cars on company's lines..	..	..	..	30.5	....

Figures taken from the book of one of the largest and most important private car companies show that during 1890 its cars averaged about 48,000 miles. The general manager of a private stock line said that the demand for private cars was such that he had been able to average more than 100 miles per car per day for his entire equipment during the past six months.

The evils resulting from the use of private cars are recognized and severely condemned by railway officers, but they are unable to do away with it at present.

In view of these facts, the committee recommended amendments to the Interstate Commerce law, prohibiting the allowance of mileage for the use of private cars beyond a reasonable compensation for the car when loaded, no mileage to be paid on the empty car. It should be also made plain that giving free transportation to persons connected with private car lines is contrary to the law as at present constituted, and that railway companies who permit private freight cars to be hauled in their trains must at the same time furnish equally good cars to meet reasonable requirements of other shippers. A statutory provision empowering the Interstate Commerce Commission to determine what is a reasonable car mileage rate was also recommended.

Master Car Builders' Association.

The committee of the Master Car Builders' Association on Automatic Coupler Standards and Limits have issued the following circular to all manufacturers of the vertical plain couplers, for the purpose of securing uniformity both in M. C. B. standards, as well as to determine a standard of excellence in material and design.

For the accurate determination of the contour lines, the gauges now made by the Pratt & Whitney Company will be used. These gauges have been determined by the executive committee in pursuance of the action of the convention and the instructions transmitted by the convention to the committee. The standards of length, thickness and other dimensions adopted by the M. C. B. Association, and illustrated in the announcement from the executive committee under date of August 1, 1891, must be strictly conformed to. The committee further recommends the pocket or "U" shape fastening in lieu of the tail bolt. The committee further proposes the following specifications for the M. C. B. drawbars:

1. Weight.—Drawbars, including knuckles and locking attachments should weigh 210 lbs. or less. They must not weigh over 220 lbs.

2. All drop tests will be made on a solid masonry foundation, as per Fig. 1, accompanying this report. The knuckle of the bar to be tested will be in its closed locked position. The bottom of the drop will be flat, so as to represent the blow from an opposing closed M. C. B. bar.

3. Pulling Test.—Drawbars must be constructed so that when subjected to a pulling test they will stand not less than 100,000 pounds.

Note.—In view of the rebound draft rigging is subjected to after an emergency application of the brakes, the committee will consider increasing this limit to 110,000 pounds.

4. Drop Test.—Drawbars should stand the following drop test: Weight of drop, 1,640 pounds; three blows at 10 feet; two blows at 15 feet. The drawbar, or knuckle must break into two or more pieces before it is considered to have failed under this test. The cracking of the parts will not be considered as a failure.

5. In subjecting bars to tests 3 and 4 the drawbars and knuckles will be considered separately, viz.: A failure of one will not condemn the other.

These specifications are not supposed to be entirely accurate, but they are offered by the committee as a step in the direction of adopting specifications which will make a standard of excellence in M. C. B. couplers.

The committee further announces that on Tuesday, the 26th of April, they will hold a meeting at Hotel Anderson, Pittsburgh, at which time they will be glad to meet manufacturers of couplers for the purpose of discussing these specifications and receiving couplers with a view to their being subjected to these tests.

JNO. S. LENTZ,
J. M. WALLIS,
G. W. RHODES, } Committee.

The Lehigh Valley has ordered four large consolidation locomotives of the Baldwin Locomotive Works, of which two are to be compounds.

The New England Railroad Club will hold its regular meeting on May 11, United States Hotel, Boston. The subject for discussion will be Rule 8 of the Rules of Interchange. Col. Frank H. Forbes will read a paper on the railroad system of Massachusetts 50 years ago.

Railroad Tickets.

At the request of the Department of Transportation Exhibits, Mr. Geo. De Haven, General Passenger Agent of the Chicago & West Michigan and Detroit, Lansing & Northern Railroads, has consented to undertake the work of making a historical collection of railway tickets. Mr. De Haven has in the past given much attention to this subject, and has accumulated a large amount of valuable data.

Railway men and others having in their possession old, rare and curious railway tickets, time-tables, etc., are requested to communicate the fact to Mr. De Haven. He will also be glad to receive information of the existence of objects of this kind in public or private collections anywhere.

All objects loaned for this exhibit will be shown in specially prepared cases, and will receive the greatest care so that no damage can occur to them. General passenger and tickets agents of railway and steamship lines throughout the world, and manufacturers of every description of tickets are invited to correspond with Mr. De Haven; as the intention is to make the most complete exhibit possible of the tickets, passes, etc., used in all countries. Mr. De Haven's address is Grand Rapids, Mich., U. S. A.

Work at Pullman.

The works of Pullman's Palace Car Company are at present engaged upon the following orders:

One hundred first-class passenger coaches for the Philadelphia & Reading Railroad Company; two dining cars for the Chicago, Rock Island & Peoria Railroad Company; 22 first-class passenger coaches for the Southern Pacific Company; six parlor cars for the Chicago & Northwestern Railroad Company; five first-class passenger coaches, five combination passenger and baggage cars and two vestibuled dining cars for the New York, Lake Erie & Western Railroad Company; two combination passenger and baggage cars for the Chicago, St. Paul, Minneapolis & Omaha Railway Company; one private car for Mr. J. J. Hagerman, President of the Pecos Valley Railroad Company; one private car for the Minneapolis, St. Paul & Sault Ste. Marie Railway Company; one first-class passenger coach for the C. & E. I. R. R. Co.; one private car for the B. & O. S. W. R. R. Co.; 25 first-class passenger coaches for the Central Railroad of New Jersey; one parlor car for the Windsor & Annapolis Railway Company; 25 first-class passenger coaches for the Norfolk & Western Railroad Company; 10 express, 10 postal, 1,000 box, and 400 coal cars for the Norfolk & Western Railroad Company; 20 first-class passenger coaches for the Chicago, Rock Island & Pacific Railroad Company; three first-class passenger coaches and one combination passenger and baggage car for the Cleveland & Marietta Railway Company.

Indicator Cards from Schenectady Compound Locomotive.

The following indicator cards were taken April 16 from one of three compound freight locomotives being built by the Schenectady Locomotive Works for the Adirondack & St. Lawrence road. The cards were taken while the engine was drawing 55 loaded freight cars on the New York Central & Hudson River Railroad. The engine steamed freely with exhaust nozzle 5 inches diameter. A brief description of the engine is as follows:

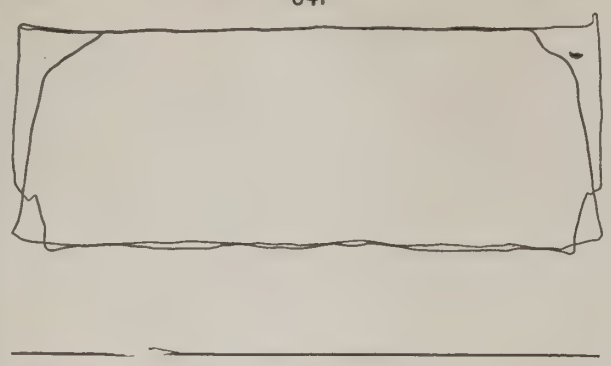
Cylinders	20 in. and 30 in. × 26 in.
Drivers	57 in. diam.
Weight on drivers	114,500 lbs.
Weight on truck	18,000 lbs.
Total	132,500 lbs.
Boiler, wagon top	58 in. diam. at first ring.
Firebox	102 in. long, 42½ in. wide.
Tubes	268 in number, 2 in. diam., 11 ft. 6 in. long.
Working steam pressure	180 lbs.
Driving journals	8 in. × 9 in.
Engine truck journals	6 in. × 10 in.
Tank capacity	4,000 gallons.
Fuel capacity	8 tons.
Tender journals	4½ in. × 8 in.

The following data is presented in reference to these cards, which we think will be acknowledged to be as good as any that have appeared from compound locomotives:

Cylinder H. P.	20 in. × 26 in.
Cylinder L. P.	30 3/16 in. × 26 in.
Diameter of drivers	57 in.
Valve travel	6¼ in.
Outside lap of valves	1⅛ in.
Inside clearance, H. P.	1/8 in.
Inside clearance, L. P.	1/8 in.
Scale of spring	100
Throttle full open.	

Card.	Revolutions per minute.	Piston speed in feet per minute.	Miles per hour.	Boiler pressure, pounds.	Point of cut-off.	Horse power.	Work done in L. P. cylinder.
					ins.		#
64	40	173.3	6.78	178	H. P. 21⅞ / L. P. 22¼	367.7	52.53
65	72	312.	12.2	170	H. P. 17 / L. P. 18⅛	528.4	50.17
50	104	450.6	17.63	180	H. P. 13½ / L. P. 15⅛	637.5	52.54
63	108	468.	18.31	180	H. P. 12 / L. P. 13⅛	609.3	51.24
61	104	450.6	17.63	180	H. P. 10¾ / L. P. 12⅜	547.7	52.43
75	192	832.	32.55	178	H. P. 10¾ / L. P. 12⅜	802.8	51.35

64.



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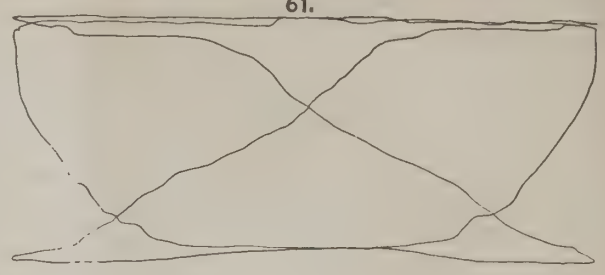

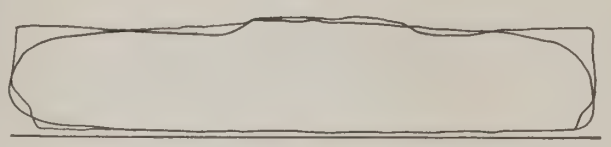

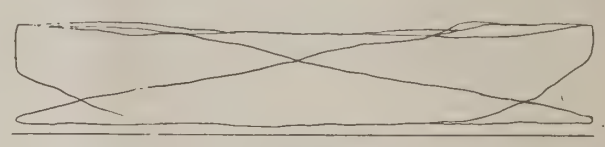

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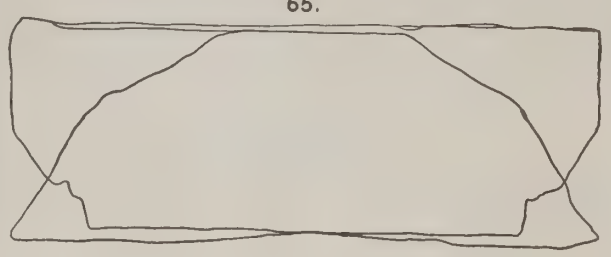

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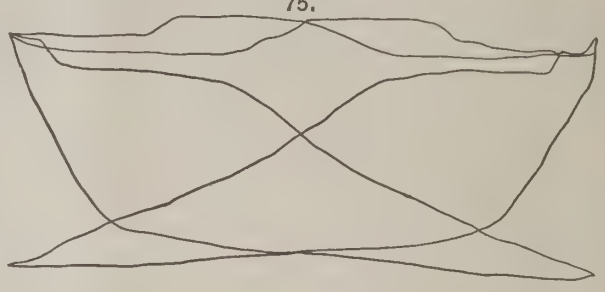

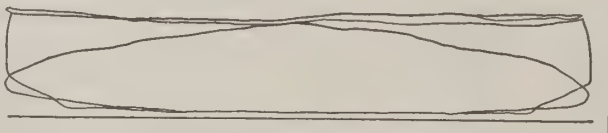

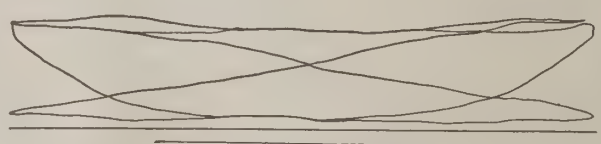

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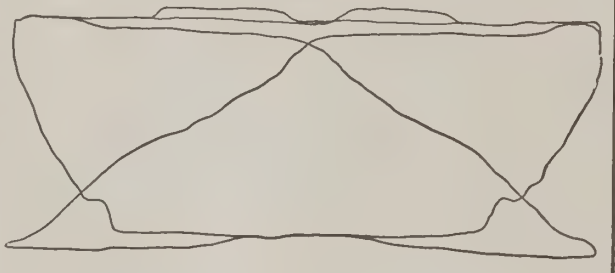

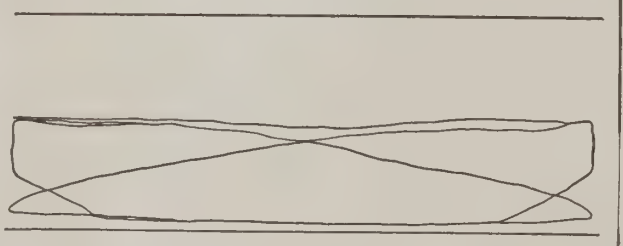

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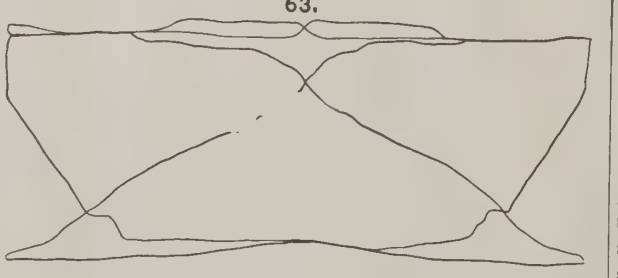
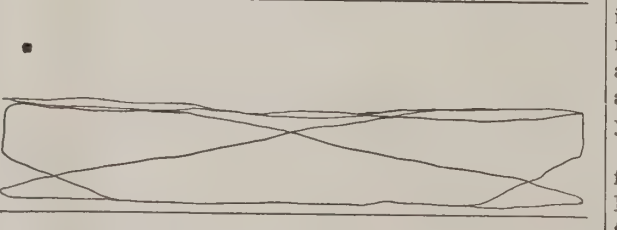




A Georgia Pacific passenger train was held up at Weems Station, 10 miles out of Birmingham, March 31. A young white man boarded the engine, and at the point of a Winchester compelled the engineer to bring the train to a standstill. Another masked man boarded the mail car, broke down the door, shot once to bring the agent to terms, and went through the letters, taking all the registered packages, then coolly left. Outside the rest of the gang were firing off their guns to keep the passengers quiet, and not a soul made a movement except the rear flagman, who was shot at for his trouble. The entire job consumed eight minutes.

The Steel Rail Trade.

While the burden of complaint in nearly all branches of the iron and steel trades is that prices are abnormally low, the volume of business being quite good, the rail makers are enjoying remunerative figures on their sales, but are disappointed in the amount of work coming forward. It is possible that one fact may make this seem worse than it really is. The railroad companies know that there is no prospect of an advance, and that the only contingency which may happen is that prices may be lowered. They are aware of the fact that capacity is ample to meet what requirements may come forward. They have fallen into the habit, therefore, of ordering only for immediate wants. Where formerly even smaller lines took all the material for a whole year's renewals in one contract, they now often enter the market month after month. The aggregate tonnage may not differ, but it naturally makes quite a different impression upon the seller.

Still, the tonnage of steel rails thus far ordered this year is a little better than it was last year. The official report shows that up to April 1 the mills in the Association had taken for 1892 delivery orders for standard sections footing up to 694,362 gross tons, against 529,588 for the first quarter of 1891, an increase, therefore, of about 160,000 tons. But the deliveries have been 296,553 tons this year, while last year, owing to the stoppage of the Western mills, they were only about 175,000 tons. The unfilled orders are consequently a little larger than they were last year. The two great Western works—the Edgar Thomson and the Illinois—had booked orders up to April 1 of about 408,000 tons. Since their percentage in the pool is about 57 per cent., they are relatively better off than the Eastern concerns, counting the Cambria with the latter. Another point should be noted so far as the Eastern works are concerned. In order to keep their works going during the last few months of 1891, at least some of them rolled rails for 1892 delivery, and these reduced the amount of business to be expected this year. In one case at least 30,000 tons were thus made in anticipation of this year's deliveries.

On the whole the situation is fair, but of course it is far from coming up to the sanguine expectations of last year. It looks now as though 1892 would go into the annals of the rail trade as one of the lean years.—*The Iron Age.*

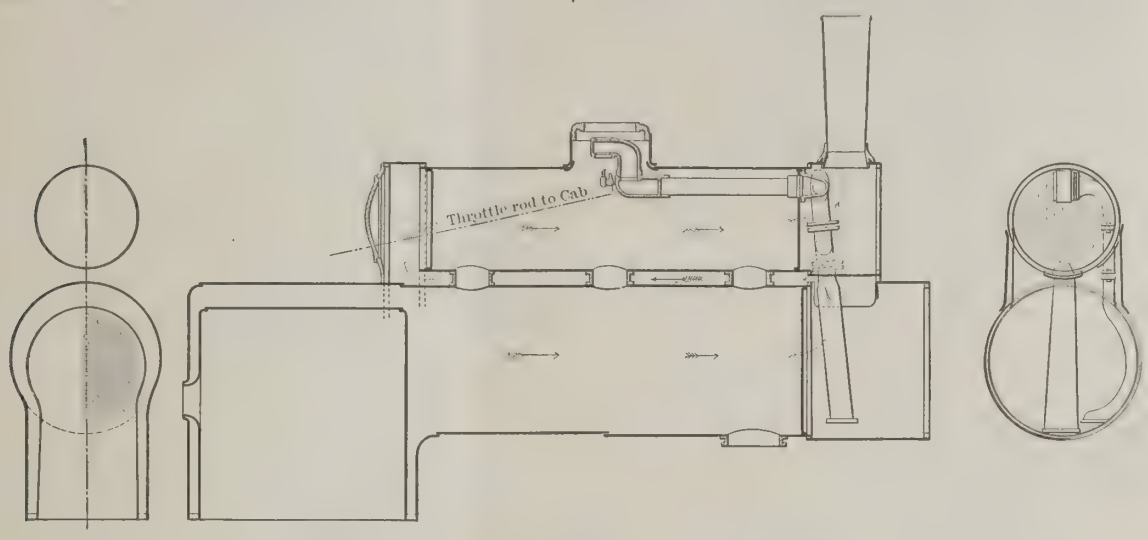
The proposition of the Standard Oil Company to furnish fuel for the Exposition power plant at 72½ cents a barrel has been accepted.

An arrangement has been arrived at between all the French railway companies, by which in future every employé, of no matter what line, will be entitled to a return free pass once a year to any station in France, and his family living with him to passes at one-quarter the usual passenger rates. This understanding will, therefore, allow employés to spend their yearly holiday in their own home, or wherever else they may choose, at little expense.

A New Design of Boiler.

In our remarks in the last issue on the new type of boiler illustrated therein being used on the Eastern Railway of France, it was said that in this issue we would illustrate a proposed boiler somewhat similar in appearance to the new French type, but intended to accomplish a widely different purpose, and designed by an American Superintendent of Motive Power. The design mentioned is shown in general outline in the accompanying cut.

The lower barrel will be as shown, nearly filled with flues and with little steam space, and free communication will be established between it and the upper barrel, to which it is intended the steam generated in the lower barrel shall have free access and be taken from there for use. The upper barrel will be partly filled with flues of considerably larger diameter than those in the lower barrel, and the fire gases will be caused to circulate between the upper and lower barrels, and through the flues of the upper barrel into its smokebox, and thence to the open air. It will be noticed that a long exhaust pipe will be used reaching into this smokebox.



NEW DESIGN OF LOCOMOTIVE BOILER.

It will be remembered that the object sought to be accomplished in the new French boiler was simply a greatly enlarged water space, and the normal water level would be about the center line of the upper barrel. In this boiler the object sought is to increase the steam space and, by causing the escaping fire gases to circulate between the lower and upper barrels and through the tubes in the upper barrel, to thoroughly dry and to some extent superheat the steam before it passes to the cylinders.

The designer of this boiler has charge of the motive power of a prominent Western road, where one of the greatest difficulties encountered is bad feed water.

He has had the scheme under consideration for several years, but its radical departure from present practice has deterred him from bringing it forward. He now invites the criticism of American master mechanics upon the design and our pages are open for the same.

History of the M. C. B. Coupler.

The following abstract from the address of President H. S. Haines, of the American Railway Association, at its meeting in New York City, April 13, is the most complete resumé of the history of the adoption of the standard type of coupler by the Master Car Builders' Association that has appeared:

The Master Car Builders' Association, composed of railroad officials in charge of the maintenance of freight and passenger cars, was organized in 1866, and the first notice that I have found of any interest in this subject on the part of any public officials, either State or corporate, is in the proceedings of their Third Annual Convention in 1869.

At that convention Mr. F. D. Adams, now and for many years past on the Boston & Albany Railroad, used the following laguage: "Many of our men employed in coupling trains are injured and lives lost because drawheads do not come into line, one being high and another low, thus driving by and crushing the man that is in the performance of his duty, or maiming him, frequently for life.

"It is a duty we owe to the companies that we represent and a duty that we owe to our fellowmen, who are necessarily placed in positions that endanger them, to adopt some height that will be uniform."

You will see from this reference that the attention of railroad officials was first called to the varying heights of drawheads and couplers as the cause of danger and of injury to railroad employés.

At the next annual meeting Mr. Adams was elected President and a committee appointed to report on a uniform height for passenger car platforms. At the meeting in 1871 this height was fixed at 33 inches for all cars, passenger and freight.

At the seventh annual meeting, in 1873, Mr. M. N. Forney, a gentleman well known to us all, "called the attention of the convention to the great number of accidents and loss of life occurring from the present method of coupling cars," and "thought the convention should take some action in the matter, with the view of remedying the evil so far as it could be done. He would, therefore, move that a committee be appointed to report at the next meeting." Accordingly a committee was appointed "on best device to prevent accidents while coupling cars. This committee reported at the meeting in 1874 that it had sent out a circular to the railroad companies and that "the general opinion as expressed in the replies received is to the effect that the variations in the height of drawbars is one of the most fruitful sources of accidents. So long as persisted in we do not think that any self-coupling drawbar can have the benefit of a fair and impartial trial. Many of our leading roads have given quite a number of self-couplers a trial, but, judging from their remarks as to how they answered the purpose for which they were intended, it would seem that they generally had failed."

At the same meeting the Standing Committee on Drawbars and Buffers, of which Mr. F. D. Adams was Chairman, reported "that a great advantage would be derived from a uniform drawbar, such as would be accepted as a standard and which should also be a self coupler; but we are not prepared to say that any has as yet been invented that is worthy of such acceptance."

This report, made in 1874, seems to be the earliest official recognition of the value of the so-called automatic coupler, now so familiar to us, and it will be seen that the general use of couplers of a uniform height was looked upon as a condition which must necessarily precede the adoption of a standard coupler, for the self-coupling principle to be made available. From this time we find the Association earnestly working to this end, and the success which it ultimately attained in establishing a uniform height really made it possible to use automatic couplers at all.

At the ninth annual meeting, in 1875, the same standing committee reported that it had "examined a great variety of new models and plans which are claimed by their inventors to be improvements, but have seen nothing that meets the demand. The drawbar should be a self-coupler avoiding the use of links and pins." This is the first appearance of a principle now well established in our minds. The report further shows that the committee were actively engaged in the search for a suitable standard coupler. The motive which actuated them was well expressed by Mr. Hopkins of the New York & New Jersey Railroad: "This Association is in duty bound to furnish some device that shall save the great number of lives annually sacrificed by the coupling of cars."

At the eleventh annual meeting, in 1877, Mr. Kirby, of the Lake Shore & Michigan Southern Railroad, said that his company intended to equip one hundred cars with self-couplers.

The President, Mr. Garey, of the New York Central & Hudson River Railroad, stated that he had been waited on by a committee of yard masters. They said: "We don't care anything about self-couplers, but only give us something, so that we can be sure that we won't be crushed in getting between the cars. Give us deadwoods right over the drawbar." Mr. Adams said: "I firmly believe we are in duty bound, as an association, to listen to the appeals of these men."

This appeal from the yardmasters turned the attention of the Association to the proper dimensions and location of deadwoods, notwithstanding the assertion of Mr. Sutherland, of the Canada Southern R. R., that "few railroad companies would be satisfied with anything short of an improvement that would entirely dispense with links and pins, so that the men can keep entirely from between the cars."

I call your attention particularly to this remark, as the first official enunciation of the fact, simple as it is, which should never be lost sight of in the discussion of the coupler question from a humanitarian standpoint.

At the twelfth annual meeting, in 1878, a committee was appointed "to investigate the causes of accidents to trainmen and report what means can be provided to protect train and yardmen from injury while in the performance of their duties," and the Yardmasters' Association was invited to communicate with the committee.

At this meeting Mr. Griffiths, in reporting on self-couplers, stated a fact with which we subsequently became very familiar, that there were so many of them "and when they come together they don't operate."

At the thirteenth meeting, in 1879, President Garey referred in his address to this subject as deserving special attention, and the committee reported, as the result of one hundred inquiries, that the yardmasters considered the variation in height of drawbars and the deadwoods on each side of them as common cases of injury.

At the fifteenth meeting, in 1881, President Garey in his address again called attention to this subject, saying: "The present defective and expensive devices for coupling freight cars have been in use for many years without any marked improvement upon the old link and pin system; none have sufficient advantages to place them in general use. The necessity for improvement in this direction is of so much importance that our legislators have been called upon to investigate the matter. Wherever it has been shown that railroad companies could better protect the lives of passengers or employés by the use of practical improvements there has been no necessity for legislative or any other pressure, other than the plain facts, to place such improvements in use."

It appears from this that in 1881, eleven years ago, the matter had begun to attract the attention of legislators, taking the usual form of a proposed investigation, and that President Garey, in noting this new phase of the question, disposed of it in fitting language. Again, in 1882, he said: "If an automatic coupler, or one sufficiently so to prevent the necessity of trainmen standing between cars while in the act of coupling, could be put in general use, with a simple and efficient trainbrake under the control of the engineer and arranged so that it could be applied from any part of the train, they would remove many of the sources of accidents to men while handling cars."

At the same meeting the Committee on Causes of Accidents to Train and Yardmen reported that they "had not as yet seen an automatic coupler that they would feel justified in recommending to the Association."

The Executive Committee provided for a public trial of automatic freight car couplers at Buffalo, on Sept. 15, 1885. Forty-two were subjected to the required tests, and from this number twelve were recommended for further trial in actual service.

In July, 1886, and in May, 1887, the Association undertook a series of competitive tests of power brakes on freight trains, and as a result of these tests it was clearly shown that link and pin couplers could not be used on a freight train equipped with power brakes; so it may be asserted that it was not until 1887 that the idea of an automatic link and pin coupler passed definitely out of the minds of practical men.

At the twenty-first annual meeting, in 1887, the Executive Committee reported "that this Association recommend as a standard form of coupling the Janney type of coupler; that the Association procure one of the present make by a committee appointed for that purpose, and then all other forms of couplers that will automatically couple to and with this coupler under all conditions of service are to be considered as within the Janney type, and conforming to the standard of this Association."

The report was adopted, and it was determined to decide by letter ballot as to the adoption of the Janney type of coupler as a standard.

At the annual meeting, in 1888, the result of the ballot was announced as 474 in favor of, and 194 against the adoption of the Janney type. It was further announced that the Executive Committee had undertaken to establish "the coutour lines of this type, and the preparation of drawings and templets which would definately determine and exhibit the standard of the Association,"

In the performance of this duty, the committee discovered that the contour lines of the Janney type were covered by patents belonging to the Janney Car Coupling Company; and on June 17, 1888, that company agreed to waive all claims for patents on contour lines of coupling surfaces of car couplers used on railroads, members of the M. C. B. Association." This waiver was formally executed in April, 1888, as applicable to freight car couplers.

It is important to remember that it was not until 1887 that the fact was established that link and pin couplers and power brakes could not be used together on the same freight train, and that it was not until 1888, just four years ago, that the essential principle of the vertical hook-coupler, which years of experiment had established as the only type practicable for a safety coupler, was made generally available by the generous action of the Janney Car Coupling Company. With these points secured, the road was made plain to the successful attainment of the result for which the Master Car Builders had striven for twenty years. What followed was mainly the filling-in of the details of the general plan. As the committee said, "The standard of the Association is, therefore, with the publication of these lines, definitely fixed; and it is in the power of any inventor or manufacturer of couplers, now or hereafter to determine for himself whether his coupler will automatically couple to and with this standard, under all conditions of service. Invention can now be directed to improvements in detailed mechanism, in strengthening parts, and devising means for the protection of the couplers against the shocks and strains of service." This is the history of the evolution of the type of safety coupler which, at the meeting in 1888, was first called the Master Car Builders' Type. Well is that association of earnest railroad officials entitled to connect its name with this excellent work in the cause of humanity.

But, as I have said, there were still details to be filled in after the general plan was adopted; details relating to certain dimensions of the coupler and to its proper location with respect to the end-sill—minor matters, it is true, but which were to be definitely decided, one way or another, if every coupler of the Master Car Builders' type was to couple with every other coupler of the same type, never mind who invented it or who made it; and to insure their final recognition by letter-ballot, the matter was carried over to 1889, when the coupler recommended by the Executive Committee was formally adopted, in all respects, as the standard coupler of the association.

Some organized action was requisite on the part of the managing officers of the railroad companies to make effective the action of the Master Car Builders at their meeting in 1889. This was sought to be accomplished through this Association. At our semi-annual meeting in April, 1890, I called this matter to your attention, using the following language: "There are improvements in methods and appliances now passing from the experimental stage, in which they are properly the subjects for consideration in technical associations, to the stage in which the responsible management of our railroad systems must decide whether they will recognize them as sufficiently valuable for general adoption."

At the same meeting the Standing Committee on Safety Appliances, in its report on this and kindred subjects, said: "Although the Committee is not now ready to recommend action by this Convention, it must not be supposed that none will at any time be suggested. It hopes, on the contrary, to be able to present more definite views at your fall meeting." At that meeting the committee recommended to the Convention the adoption of the Master Car Builders' type of automatic freight car coupler as the standard of its members. Mr. Voorhees, General Superintendent New York Central & Hudson River Railroad, moved the acceptance of the report and called for a vote by companies. Out of fifty companies voting there were but two that dissented; and it may be said that in October, 1890, the Master Car Builders' freight car coupler was recognized by the railroad companies of this country as the standard coupler, so far as it was possible for this to be done by their organized action.

The Master Mechanics' Association Committee on Compound Locomotives is making a series of tests on the C. M. & St. P. of two 10-wheel engines, one simple and one Vauclain compound. Mr. George Gibbs, chairman of the committee, is in charge. With the new dynamometer car and apparatus provided it is expected these tests will be the most accurate ever made of a compound locomotive.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

STRENGTH OF COUPLERS.

The interest of the public, of Congress, of railroad men and of manufacturers of railroad equipment continues to increase in the Master Car Builders' type of car coupler. The conditions of service to which it is subjected, its design, proportions and strength have furnished themes for many interesting debates at club meetings and in the pages of the technical press.

The question of the best material for its construction is at present exciting unusual interest, and discussion has shown that while the superior strength and ductility of well-made cast steel over the malleable iron product is demonstrated by tests, yet malleable iron for couplers has many friends who question the all around superior reliability of cast steel for couplers in every day service. The advocates of cast steel acknowledge that there must be improvements made in the manufacture of the product that will give sounder and more reliable castings, but assert their belief that such improvements will be made, and that already the product is superior to malleable iron in all important respects for the manufacture of couplers. This again is questioned by many who have had much experience in the use of steel, and it is probable that converts of cast steel for couplers will come in rather slowly at present.

But, however much difference of opinion may exist as to the particular metal that is best for couplers, no great difference of opinion can reasonably exist among those responsible for the prompt and safe movement of trains as to the degree of strength to resist pulling strains and buffing blows desirable in an unprotected coupler of heavy cars.

Within reasonable weight and cost there cannot be an undesirable surplus of strength. Couplers that do their own buffing are subjected to harder usage than any other part of rolling stock equipment, and the greatest strength is desirable.

The cost of replacing a broken coupler does not by any means measure the cost of its failure, for delay to traffic, time of train or yard employés, and, if on the road, increased fuel consumption by the locomotive, and possibly disastrous consequences are elements of the cost, the aggregation of which is considerable, and often is much greater than the simple cost of replacement.

LAG CYLINDER HEADS.

A somewhat prolonged discussion has recently been carried on in the columns of an English contemporary concerning the comparative effect upon cylinder condensation of jacketed sides and unjacketed ends of engine cylinders.

While the point is not a new one by any means, it having been written upon before, it is yet one that has not received the attention it properly deserves, and in its relation to the better protecting of locomotive cylinder heads, especially the front ones, it should receive consideration by those interested in the economical operating of locomotives. The sides of locomotive cylinders are generally fairly well protected by suitable lagging, but the heads have seldom any further protection than metal casings with a small air space between them and the heads.

Owing to the cooling effect of the escaping exhaust steam upon the cylinder ends and pistons these parts exert the most potent influence in cooling the incoming steam for the return stroke by absorbing heat sufficient to equalize their temperature with that of the steam in contact with them, and because at the beginning of the stroke the piston is moving at its slowest velocity the steam is held for a comparatively longer time in contact with a large cooling surface than at any other point of the stroke. Thus the conditions are plainly most favorable at the cylinder ends for the rapid abstraction of heat from the steam. When the exposed position of front cylinder heads is considered in connection with this, together with the hurricane of wind, often below zero in temperature, that is constantly blowing against them while running, the need of the best possible lagging for cylinder heads proclaims itself very loudly.

A popular error that many fall into, and that the text books frequently encourage, is that air is an insignificant absorbent of heat. It is true that perfectly dry air is almost absolutely transparent to rays of heat, but such perfectly dry air is seldom obtained except artificially, and the small percentage of moisture existing in the outside atmosphere increases its power for absorbing heat until it is commonly but little less than one-fourth that of water. When currents of such a capable absorbent traveling, practically, with a velocity of many miles per hour have free play upon cylinder heads protected only by a metal casing, they certainly abstract a large amount of heat from the steam in those ends of the cylinders at the very moment when its loss is most damaging to the efficiency of the engine.

In days when "set out packing" was a frequent report upon the roundhouse register anything that would have in any way increased the work of removing cylinder heads would not have been tolerated, but cylinder heads are now comparatively seldom disturbed, and an effective lagging could easily be used at little expense.

WHO SHOULD FEED A BOILER?

The Louisville & Nashville railroad has adopted the practice of placing both injectors on the right side of the locomotive where they will both be under the easy control of the engineer. The reasons stated for so doing are that by this arrangement both injectors can be more conveniently operated alternately and thus both be kept in good condition, which is seldom done when one is placed on either side of the engine; and also with this arrangement it is possible to use a double check valve with but one opening in the boiler, which of course reduces by one-half the danger of having check valves knocked off in case of accident. While this is a radical change, the reasons assigned are eminently sensible and there can be little doubt that the benefits anticipated from the change will be realized. Probably the old saw about disuse being the worst abuse has no more forcible application than in reference to injectors, as all who have had experience with them know. The combining of the two check valves into one with but the one opening in the boiler instead of two is a step forward in the direction of safety and economy.

But the aspect of the case to which we invite attention is that by this arrangement the operating of the injectors is almost imperatively assigned to the engineer, since it would be inconvenient and undesirable for the fireman to go to the engineer's side of the cab to start or shut off an injector.

This suggests the question asked in the above caption, Who should feed a boiler? Long established and general custom has familiarized us with the idea that, in locomotive operating, the engineer is the proper man to attend to the very important matter of supplying water to the boiler. But is he really the best man to do so? Are his duties such that he can always give the attention to feeding water to the boiler that will bring about the best results?

Fuel economy in locomotive operating depends very largely upon the management of the injector, and the management that will give the best results demands much careful attention. With the responsibilities necessarily placed upon the engineer of getting his train safely over the road on time and watching the track, the signals, his engine and his train, he is often so absorbed in attending to these imperative duties that the feed of water to the boiler is neglected to the serious detriment of fuel economy.

On the other hand, the necessary condition of the fire (especially in soft-coal burning engines) and the work of the fireman is really governed more by the feed of water to the boiler than by the working of the engine. They are the two conditions of locomotive management that most necessarily go hand in hand, each depending upon the other. This being true, it follows that such mutually dependent conditions should be treated by one man, and he the fireman. He has no duties to call his attention away from managing the fire and regulating the boiler feed to secure the best results, and as neglecting his injector would generally add greatly to his labor, he would always have the most effectual inducement to give it proper attention.

As to responsibility for the safety of the boiler, the fireman could be made equally responsible with the engineer; neither is under bonds, and neither has more at stake than his personal safety, reputation and position. We have no doubt that if the responsibility were placed upon the firemen they would generally acquit themselves as creditably as the average engineer, and with the engineer responsible, as he now is, for his whole engine, there would be an added assurance of the safety of the boiler, a relief to the engineer of what are sometimes petty attentions, a lightening of the fireman's labor and increased economy for the engine.

In presenting this view of the case we are not suggesting an experiment. It has been the practice for a number of years on at least one division of a large railroad to have the fireman, instead of the engineer, feed the boiler; and the results have in every way justified the practice, no damaged boilers resulting, and the division being noted for the economy of the fuel consumption of its locomotives.

MAINTAINING DISCIPLINE.

In maintaining a proper degree of discipline in railroad service it very frequently becomes necessary for officers to institute investigations concerning matters that have caused trouble, delay or expense. While such inquiries are absolutely necessary to the proper conduct of railroad business and are rarely made with any other object in view but simply to get at the facts in the case for reference or proper treatment, it often happens that the employé concerned gets the impression that he is being pursued on personal grounds, and that what has been said and done has not been strictly as a matter of business, but because the official entertained a dislike for him and was using the opportunity to make the case as burdensome as possible.

It is much to be regretted that such misunderstandings arise, for they cause much needless worry to the employé and added unpleasantness to the duties of the officer.

No officer worthy of the position he holds will allow personal likes or dislikes to influence him in his official treatment of the men under him. Generally railroad officers pride themselves on their impartiality, and with good reason, for it is an important attribute in the successful managament of men, upon which the success of the property in their keeping and their personal success largely depends. But careful as they may be to be reasonably courteous in their investigations, and eminently fair and just in their decisions, they are not at all times given credit for so doing by misjudging employés for whom it is easier to believe others malicious than themselves at fault.

On the other hand, there is one prolific cause of misunderstandings between officers and employés, unpleasant for both and unprofitable for the interests they both serve, and that officers are responsible for by holding themselves aloof from the men who serve under their direction. Human nature is much the same all over the world and among all classes of people, and a show of a feeling of superiority creates resentment everywhere. That is disastrous to good service. Unapproachableness in a railroad operating officer is a folly dearly paid for by the interests that employ him, for such a man can never inspire the *esprit de corps* of those under his authority, by which alone the best results can be accomplished. Any man whose dignity has so little back of it that he must protect it by rudeness to others is out of his appropriate place in the management of men.

What is needed is more confidence between officers and employés as regards the good intentions of each other. An intelligent superintendent of a prominent railroad recently said that one of the most trying duties of an officer was to maintain discipline, and that his decided opinion was that the officers of a road could not get too near the men; and that if the officers had half the confidence in the men that the men had in the officers, they would not, he thought, have any friction or trouble.

In no department of railroad operating is this matter of greater importance than in the mechanical department, for there the greatest extravagances can be indulged in and the greatset economies effected, and much depends upon the spirit of those in its employ.

GOOD THINGS UNAPPRECIATED.

At a dinner given by the New York Chamber of Commerce April 16, to Mr. Whitelaw Reid, United States Minister to France, Mr. Reid in the course of a speech said: "Our friends, the French, are at this moment enormously prosperous—probably the most prosperous nation in Europe, and with their prosperity the most widely diffused. And yet, when I contrast the French condition with ours, when I recall our own popular grievances—as to railroads, for example—and remember that there is not in all France a train to be compared to those on which you daily travel to Washington or to Chicago—that no money can there purchase equal luxury, and that what you can purchase costs you double as much per mile—or when I recall other of our grievances as to the cost of living, I wonder if occasionally our national complaints may not spring less from the acuteness of our sufferings than from the acuteness of our politics."

The experiences of foreign travel are great eye-opener to Americans, and generally awaken in those so favored an

admiration for our really excellent and unsurpassed means, conveniences and luxuries of life, travel, communication and transportion little thought of and less appreciated when in daily enjoyment thereof. And as to complaints springing "less from the acuteness of our sufferings than from the acuteness of our politics," it is probable that they spring mostly from ignorance of the true condition of things and from that unreasoning selfishness common to narrow-minded people incapable of considering any claim but their own, or any condition outside of their vicinity.

Waste Heat of Fire Gases.

On another page will be found an illustration of a new design of boiler proposed by the Superintendent of Motive Power of one of our Western roads. The intention of the design is to thoroughly dry and partly superheat the steam before using it by means of the waste heat of the escaping fire gases. The engines in his charge are operated in a section of country where the available supply of water is such that priming is a great annoyance and of course very expensive, and by the water carried to the cylinders washing the oil from the internal rubbing surfaces the expense of repairs is greatly increased.

We are glad to see an indication that those in charge of locomotives are beginning to appreciate the loss due to the high temperature of the escaping gases of combustion, and propose doing something to utilize their excess heat for some useful purpose. As is well known the temperature of the escaping fire gases from locomotives is in the neighborhood of 800 and 1,000 degrees Fahr., or about 400 degrees above the temperature of the water and steam within the boiler. Of course this is a great loss, and any arrangement that will reduce or recover the escaping heat will add to the economy of the engine if the advantage is not neutralized by other influences.

Facilitate Insurance.

Railroad companies having insurance systems should have a certain amount of interchangeability and union among them, so that employés leaving the service of one company can go into the insurance system of another without increased disability on account of age, but, of course, not to be eligible to pension benefits if such exist. One of the strongest inducements that the different labor organizations have for railroad employés, and one of the strongest holds they have upon their members, is their systems of insurance that remain effective as long as the membership continues, regardless of change of location or employment. *Engineering* in treating of the status of trade unions in England says: "Only a small proportion of trade unions make any provision for sickness, but those that combine this benefit with the others see its utility in the influence it exercises over the members; it is permanent and abiding, and gives stability to the union."

All encouragement and every reasonable aid should be given that large class of employés who really prefer to remain, or become, untrammeled by association obligations, so that they may do so without personal loss or inconvenience.

English manufacturers have been rather slow in engaging space for the display of their products at the Columbian Exposition, feeling secure, doubtless, from the success ful competition of American or other manufacturers because they at present lead the world in trade. The United States, however, is reaching out for trade that has long been England's exclusively, especially in South America, and one Englishman writing to one of our contemporaries sounds the alarm, saying:

"The Exhibition to be held at Chicago next year, ostensibly to celebrate the fourth centenary of Columbus, will be in reality a great commercial battlefield, in which the hosts of the United States, of Germany, and of England, will be drawn up to struggle for supremacy in the markets of the world."

Some objection has recently been expressed by certain manufacturers of railroad equipment to the growing practice of purchasers carefully inspecting and testing material bought so as to assure themselves that it is equal in all respects to the requirements. It should be understood that such inspection and tests are not conducted by the railroads as a check upon the suspected dishonesty of manufacturers, but simply as a matter of business in order to know that they get what they pay for, and as a check upon loose shop methods that they are fully aware creep into their own practice and in all branches of manufacture. Tests are a protection of the interests of the buyer, and also a protection to the honest manufacturer against the machinations of dishonest competitors.

Up to the time of going to press three locomotive boiler explosions are reported for April: One on the Missouri, Kansas & Texas, April 3; one on the Illinois Central, April 5, and one on the Long Island Railroad, April 6. Fortunately no one was hurt in the M., K. & T. explosion, as nobody was about the engine at the time. The engineer and fireman of the Illinois Central engine were badly injured, and three men were killed and two seriously injured in the Long Island explosion.

It is reported that in the Illinois Central and Long Island explosions the crown sheets gave way.

All of these explosions are calls for a more thorough and systematic system of boiler inspection.

Literary Notes.

The Electric Railway. By Oscar T. Crosby and Louis Bell, Ph. D., New York. The W. J. Johnston Company, Limited. 1882. Price, $2.50.

In this treatise on the electric railway the authors present both the elementary theory of the subject and the general features of the best practice, giving specific instructions when necessary to aid in a perfect comprehension of the advantages of modern methods.

The book treats of prime movers, motors and car equipment, miscellaneous methods of electric traction, and in an appendix gives some plain instructions to linemen.

It contains much of interest for those who wish to post themselves on electricity as applied to the movement of cars.

The Mechanical Engineers' Pocket Book. By D. Kinnear Clark, M. Inst. C. E., etc., etc. Pp. 656. index, New York: D. Van Nostrand & Company, 1892. Price, $3.00.

The author's name is too well known to mechanical men in America to need an introduction, and the fact of its being on the title page of a book of reference in engineering practice is in itself an assurance of excellence.

This, as its name indicates, is a book suitable for the pocket, and has round corners and flexible covers, and in weight and volume is all that could be desired. The book contains about 350 tables of calculations relating to the principal branches of mechanical practice, and about 500 rules with data of general utility classified for reference.

Besides the usual mathematical tables and rules for the measurement of surfaces and solids, many useful tables of weights and measures of the different countries of the world are given, and tables of the strength of bars, sheets, beams, joists, tubes, bolts and nuts, chains and other manufactured products.

By the information presented in a condensed form in this book much time and labor of calculation can be saved busy men.

Forney's Catechism of the Locomotive.

A recent mention of books on railroading stated that Forney's "Catechism of the Locomotive" had been "perhaps more widely read and used than any other book on railroading."

We may add that no book on railroading has ever accomplished more good among practical men than it has, as its influence has been felt by many in the mechanical department of every railroad in the country.

Mr. Forney once said that what he considered the highest compliment ever paid him was when Mr. Theo. N. Ely said that he had read the Catechism through six times. We consider the remark quite as creditable to Mr. Ely as complimentary to Mr. Forney.

To the writer the Catechism came in his firing days a number of years ago as a great enlightener of mysteries, and much of whatever modest success he has since attained in railroad work he knows to be due in a great measure to its early teachings and the advantage they gave him in the competition for advancement.

The book is published by the *Railroad Gazette*, New York, and the late revised edition is as much improved over the old well-known edition as the locomotive of to-day is improved over those of 20 years ago. It is up to date and should have a place upon the table of every man connected with the operating or maintenance of American locomotives.

We have received a pamphlet issued by the Arbitration Committee of the Master Car Builders' Association, containing 97 pages, and giving the reports of the committee on cases referred to them from No. 1, November, 1888, to No. 110, February, 1892. Summaries of all these cases have appeared in our columns.

The Conventions.

The annual convention of the Master Car Builders' Association will meet at Saratoga, N. Y., Wednesday, June 15, and the annual convention of the American Master Mechanics' Association will meet at the same place Monday, June 20.

The headquarters for both associations will be at the Congress Hall Hotel, where a rate of three dollars per day will be charged those attending the convention. The Grand Union Hotel will also be open for guests. There will be no charge for exhibits at the Congress Hall Hotel.

The "Teutonic," of the White Star Line, arrived at Queenstown at midnight on April 19, having made the trip from New York in five days, twenty-three hours, twenty-nine minutes. The course which she took was 2,900 miles long, making an average hourly speed of 20.21 knots. The "Teutonic" has the record for the quickest western voyage, and for the quickest eastern voyage. Her last performance gives her the record for the best hourly speed ever made in an eastern voyage. Her daily runs were as follows: 312, 450, 470, 470, 481, 472 and 245 miles. The sum of 481 miles is said to be without parallel.

According to dispatches from the City of Mexico, train wreckers are summarily dealt with in that country. Six men caught by the police loosening rails on the Mexican Central were immediately shot. A few doses of the same medicine would prove an excellent remedy for the mania in this country.

Testing Crank Pins and Firebox Sheets.

In a discussion at a late meeting of the American Institute of Mining Engineers, Dr. Charles B. Dudley, Chemist of the Pennsylvania Railroad, gave an interesting account of some recent work in the testing department at Altoona.

The standard specifications of the Pennsylvania Railroad for crank-pins provide that for every 50 pins ordered the manufacturer shall ship 51 pins. When the shipment is received one pin is taken at random from the lot and a piece is cut from each side of it and tested. The specifications require these pieces to show at least a certain ultimate strength and elongation. In testing a recent shipment, the piece from one side of the pin showed 88,000 pounds strength and 22 per cent. elongation, and the piece from the opposite side showed 106,000 pounds strength and 14 per cent. elongation. Each piece was above the specified strength and ductility, but the lack of uniformity between the two sides of the pin was so marked that it was finally determined not to put the lot of 50 pins in use.

To guard against trouble of this sort in future, the specifications will be amended to require that the difference in ultimate strength of the two specimens shall not be more than 3,000 pounds.

A new specification has been for some time under consideration for firebox sheets, and it is proposed to introduce in it what is called a homogeneity test. Experience shows that with the possible exception of cracks near staybolts, blistering is the principal cause which makes the renewal of fireboxes necessary. The cause of blistering is as follows: In rolling steel plates minute bits of slag or gas bubbles in the material are flattened out and form a break in the continuity of the metal. When the sheet is in use in the firebox, one side is subjected to an intense heat, and the other side is kept much cooler. When the heat in passing through the metal reaches one of these flattened air spaces or flakes of slag, possibly a quarter inch in diameter, it is somewhat obstructed, and consequently the portion of the plate between this spot a nd the fire becomes hotter than the surrounding metal. This overheated portion expands and lifts up from the metal beneath.

The homogeneity test is merely a nick-bending test slowly made. On bending, the little cavities above referred to open and become plainly visible. Many samples of mild steel which are perfectly satisfactory in strength and ductility, show an abundance of these little openings.

Dr. Dudley's description of how the work of compiling the new specification for firebox sheets was set about gives a good idea of the system on which the Pennsylvania Railroad compiles its specifications. The first step was to collect samples from about 60 worn-out locomotive boilers whose life was known. One piece from each firebox was tested for ultimate strength and elongation. Then 30 of these pieces were turned over to the laboratory and analyzed for carbon, phosphorus, silicon, manganese, sulphur and copper. The specimens taken represented boilers which had done good service, as well as those which had done poor service.

From the data thus obtained the first draft of the specification was made, and copies were sent to the purchasing agents with the request that they would send it to all the manufacturers of boiler plate from whom they might possibly wish to buy, requesting their criticisms. Copies were also sent to the mechanical officials of the company throughout the road, for their criticisms. When all the information thus obtained was collected, everything was embodied in the specifications that fairly could be in view of the experience on both sides.

Dr. Dudley said that, although the new specifications had been under consideration for several months, they had not yet been issued. After a specification is put in force, it is held open to amendment, as difficulties occur in its application. Some of the specifications now in use by the Pennsylvania Railroad have been revised four times since they were originally issued. As an example of the progressive improvement in specifications, in the early days of steel boilers the specifications in force called for steel of not less than 50,000 pounds tensile strength, and not less than 25 per cent. elongation. Some metal was received having 75,000 pounds tensile strength, and as the elongation was all right it was accepted; but when these plates were being flanged in the boiler shop, they cracked and went to pieces. As a result, a limit of 65,000 pounds tensile strength was established.

Duties upon imports of coal have been abolished in Uruguay.

The Professor of Qualitative Analysis in Michigan University, Prof. E. D. Cambell, was at work April 13, in the chemical laboratory, over a glass receiver containing hydrogen and oxygen, when an explosion occurred. Bits of glass flew into his eyes, inflicting such severe injuries that both eyes have been removed. The same day, in Paris, an explosion occurred in the chemical laboratory of the École de Medicine, during the course of some experiments. One of the students had one of his arms blown completely from his body and one of his eyes destroyed. The windows of the school and the buildings in the immediate vicinity were shattered, and the room in which the accident occurred was badly wrecked.

Personal.

Mr. L. J. Buckley has been appointed Purchasing Agent of the Baltimore & Ohio.

Mr. A. Foster has been appointed Purchasing Agent of the Central Railroad of New Jersey.

Mr. A. C. Hinckley, Master Mechanic of the Union Pacific shops at Salt Lake City, has resigned.

Mr. E. Evans, Master Mechanic of the Baltimore & Ohio Southwestern at Chillicothe, O., has resigned.

Mr. Charles A. Thompson has resigned as Superintendent of Motive Power of the Long Island Railroad.

Superintendent Blood, of the Camden & Atlantic Railway system, was 20 years ago a water boy on the Long Island road.

Mr. J. L. Greatsinger has been appointed to succeed M. L. Carpenter as General Manager of the Duluth & Iron Range road.

Mr. W. H. Whyte has been appointed Master Mechanic of the Eastern of Minnesota, vice Mr. E. M. Andrews, resigned.

Mr. James Kegan has been appointed to succeed the late S. D. Bradley as Master Mechanic of the Grand Rapids & Indiana road.

Mr. R. H. Johnson has been appointed Master Mechanic of the Monterey & Mexican Gulf, with headquarters at Monterey, Mex.

Mr. John Fagan, Master Mechanic of the Atchison shops of the Atchison, Topeka & Santa Fé, has resigned, after serving that company for 20 years.

Mr. S. Higgins has been appointed Assistant Superintendent of Motive Power of the New York, Lake Erie & Western, vice Mr. W. F. Turreff, deceased.

Mr. T. N. Ely, General Superintendent of Motive Power of the Pennsylvania Railroad, has retired to accept the position of Fourth Vice-President of the company.

Mr. S. D. Casanave, Superintendent of Motive Power of the Pennsylvania Northwest system, succeeds Mr. T. N Ely as General Superintendent of Motive Power.

Mr. James H. Scott, Engineer of Tests of the Southern Pacific, has resigned to accept a better paying position with an engineering establishment in Richmond, Va.

Mr. A. H. Palmerton, formerly Superintendent of the Peoria & Eastern Railroad, has accepted the position of General Manager of the Rio Janeiro & Western Railroad of Brazil.

Mr. D. L. Barnes, of the *Railroad Gazette*, gave a lecture, March 24, on "Modern Locomotive Construction" before the students of the Engineering College of the University of Illinois.

Gen. George Stark, formerly Manager of the Boston & Lowell R. R., and at one time Vice-President and General Manager of the Northern Pacific R. R., died at Nashua, N. H., April 13, at the age of 69.

Mr. A. D. Kilborn, a locomotive engineer on the Sacramento Division of the Southern Pacific, has been appointed Master Mechanic of the Shasta Division, with headquarters at Dunsmuir, vice Mr. H. Stillman, appointed Engineer of Tests.

Mr. A. E. Mitchell, who has been Mechanical Engineer of the New York, Lake Erie & Western, has been appointed Superintendent of Motive Power of the road and its leased lines, with headquarters at New York City, vice Mr. Ross Kells, deceased.

Mr. H. Stillman, formerly Master Mechanic of the Shasta Division of the Southern Pacific, has been appointed engineer of Tests, with headquarters at Sacramento. Mr. Stillman is excellently qualified by both education and experience to fill his new position.

Col. Calvin Goddard died in San Francisco, Cal., April 4, in his fifty-fifth year. He was President of the Chicago & South Side Rapid Transit Railway (the "Alley" elevated railroad), and had gone to California to recuperate from an attack of the grip.

Mr. Samuel F. Prince, formerly Mechanical Engineer of the Philadelphia & Reading, but who was placed in charge of the mechanical department of the Long Island Railroad early in February, has been appointed Superintendent of Motive Power of the latter road in place of Mr. Charles A. Thompson, resigned.

Mr. S. T. Pope, formerly connected with the mechanical department of the Chicago, Burlington & Quincy, and later Trainmaster of the same road at Chicago, Superintendent of the Duluth & Iron Range road, and Superintendent of the Chicago City Railway Company, died at Pasadena, Cal., March 21, of consumption, aged 33.

Mr. Cornelius Shields, General Superintendent of the Chicago, St. Paul & Kansas City, has resigned that position to become Superintendent of the Western division of the Great Northern. Mr. Shields began railroading as a water boy on the Southern Minnesota division of the Chicago, Milwaukee & St. Paul, and occupied successively the positions of operator, agent and dispatcher on that road.

Mr. William C. Taylor, formerly Division Superintendent of the New York, Lake Erie & Western, died in Brooklyn, N. Y., recently. During the war he served as second in command under General McCallum in the railroad service, and was Superintendent of Transportation with General Sherman on the march to the sea. After the war Mr. Taylor was connected with transportation schemes in the West.

The following changes in the personnel of the officials of the mechanical department of the Queen & Crescent system are announced: Mr. J. P. McCuen has been appointed Master Mechanic of the Alabama Great Southern division, with headquarters at Birmingham, Ala.; Mr. J. G. Tomlinson is transferred from the Alabama Great Southern division to the Alabama & Vicksburg and New Orleans & Northeastern divisions, with headquarters at Meridian, Miss., and Mr. J. C. McCarthy is transferred to the Vicksburg, Shreveport & Pacific division, with headquarters at Monroe, La.

Mr. Timothy Hopkins, Treasurer of the Southern Pacific and the Central Pacific, resigned those offices April 1. He was an adopted son of the late Mark Hopkins, and under the settlement of the will of Mrs. Hopkins-Searles he received a fortune of $4,200,000. Mr. Hopkins has presented to Leland Stanford University his collection of books on railroading, numbering 1,000 volumes, and an equal number of pamphlets. He had already designated several thousand volumes which he had intended to purchase, but was prevented by pressure of other business. These will now be procured.

General Manager William F. Hallstead of the Delaware, Lackawanna & Western Railroad is a splendid example of the successful railroad man who, from the less important places in the service, has by sheer hard work reached the higher ones. He was born in Benton, Luzerne County, Pa., in 1837, and entered the railway service in 1852 as a brakeman on the Lackawanna. From 1852 until 1872 he rose steadily from one position to another, acting as brakeman, conductor, dispatcher, then as assistant superintendent and division superintendent. In 1886 he was made General Manager of the entire Lackawanna system and holds that position at the present time with great credit to himself and benefit to his road.

An Old Engineer.

One of the oldest, if not the oldest, locomotive engineer now living in America, is Captain Joel Barlow Sawyer, of Denton, Tex. He was born in Heniker, N.Y., over 80 years ago, on Nov. 23, 1812. He was in the navy during the war, and was captain of the surfboats at the taking of Hilton Head, S. C. In 1835 and 1836 he was one of the four engineers on the Boston & Worcester Railway. The length of the road was then forty-four miles and extended from Boston to Worcester. The road was opened July 4, 1835, and Mr. Sawyer went on the road the month following.

He is fond of relating that the passenger cars of those days would only accommodate about 24 persons, and that while frail in construction and carried on four wheels only they were yet often elaborately painted. The average passenger train consisted of four or five cars, and the time table for the forty-four miles was two and a half hours, with nine stops, and the fare was $1.50 for the entire distance. In 1835, when he began his career as a locomotive engineer, there were perhaps less than 50 locomotive engineers in the country. Captain Sawyer says that he has heard of none of his contemporary engineers being alive. He was an engineer on different roads, principally in Georgia and South Carolina up to 1853, when he accepted and filled for three years the position of Master Mechanic on the New Orleans, Jackson and Great Northern Railway. He was offered the superintendency of the Houston and Texas Central Railway in 1858, but declined to accept the place, as he was then in good circumstances. The venerable old man has long since quit railroading, and for 21 years has been a citizen of Denton.

More showers of rain have fallen recently in California, and the country is said to be in better condition than at this time for many years past. The outlook for fruit is especially good, and this year will probably see more green fruit shipped to the East than any previous season. The fruit men have gained an important concession from the Southern Pacific Company, as they have received assurances that the rate for deciduous fruit on fast trains will be reduced from $2.50 to $1.50 per 100 pounds. One fast daily fruit train will also be run through from Sacramento to Ogden in 40 hours. The lines east of Ogden will probably make equal concessions, and the prospect is that California fruit will form an important part of eastbound shipments and be plentiful in the market this year.

Fast Run on the Wabash.

March 21 the Chicago & Alton put on a train between Chicago and St. Louis to cover the distance in 8 hours and 30 minutes, mention of which appeared in these columns in our last issue.

The Wabash officers declared that there "wasn't anything on wheels that could cover the ground between the two cities faster than Wabash engines." The opportunity for demonstrating what they could do was offered on April 10, when a special of five cars, including a dining car, and with the Lillian Russell Opera Company on board, was dispatched for St. Louis. The run from Chicago to St. Louis, 286 miles, was run in 6 hours and 15 minutes, which is the fastest run ever made between the two cities. The train left Chicago at 11 A.M. and arrived at St. Louis at 5:15 P.M.

Much faster time could have been made as there were several delays owing to errors of judgment in dispatching. For instance 25 minutes was given to get out of Chicago. The engineer only used 18 minutes, and the train had to wait seven minutes for the schedule time. A hot box consumed ten minutes, and there were several slight mistakes that delayed the time fully 15 minutes, and that, if the run was repeated, would not occur again. With the experience gained in this run a second run can probably be made in five hours and 45 minutes with the same weight of train. Engine 151, in charge of Engineer A. L. Padgett, pulled the train from Chicago to Decatur, 173 miles, and broke the record for fast running on that division. Engine 175, illustrated with inset in our last issue, in charge of Engineer L. Hart, pulled the train from Decatur to St. Louis, and broke the record for speed on that division.

Twelve miles from Forrest to Sibley, up hill, were run in 11 minutes, 65 miles per hour, and 21 miles from Bement to Decatur, slightly ascending grade, were run in 17 minutes, 74.12 miles per hour, by Engine 151.

Sixty-three miles from Decatur to Litchfield were run in 65 minutes, over 59 miles per hour, and 49 miles from Litchfield to E. St. Louis were run in 49 minutes by Engine 175.

It is computed that there are 900,000 miles of telegraph lines, and 2,500,000 miles of wire conductors for the use of the public throughout the world, more than one-half being in Europe. There are 98,465 offices, 67,465 being in Europe. The number of messages transmitted in a year is put at 296 millions, 207 millions being in Europe. Of the total 57½ millions were transmitted from one country to another. The payments amount to $450,000,000.

The bridge built by the Southern Pacific over the Pecos River, near Shumla, Tex., is the third highest bridge in the world and the highest in the United States. It is 2,180 feet in length and 328 feet above the surface of the river. The bridge cost $2,000,000. By the building of the bridge and the new cut-off stretch of track, the Southern Pacific shortens its road from New Orleans to San Francisco fifteen and a half miles. The old line through the cañons of the Rio Grande is to be abandoned. On the old line are fourteen large iron bridges that are to be used elsewhere. The line that is to be abandoned was built at great expense and has always been considered the most dangerous stretch of track on the whole line of the Southern Pacific, owing to the threatened landslides and exposure to cloudbursts which are of common occurrence in that locality.

An improvement in incandescent lamps has been invented by Mr. E. W. Applegate, of Chicago, an electrician in the employ of the Western Union Telegraph Company, which, if it proves successful, should result in an important reduction in their cost by doing away with the use of platinum wire. The inventor closes the top of the glass bulb with a "lava" head, in which the leading in wires are imbedded, and these wires may be of any metal. In lamps commonly used, platinum wires, fused into glass tubes, are used for the leading in wires, and though the amount of platinum required for a single lamp is minute, the aggregate demand has had the effect of largely increasing the price of platinum, and it is now said to be the chief element of cost in lamps. Mr. Applegate also seals an exhaust tube in the head of his lamp, and claims his construction to be such that a broken filament can be replaced at slight expense.

In the latter part of March the new Baldwin compound locomotive, built for the Master Mechanics' Committee, was put in service for a few days on the Chicago, Burlington & Quincy, the intention being that if the engine worked successfully a series of tests would be conducted with it in comparison with the two-cylinder compound locomotive built by the C., B. & Q.

Considerable trouble was at first experienced through failure of the engine to generate sufficient steam, the fault being in the unsuitable character of the grates for burning the coal used on the C., B. & Q. Upon applying the C., B. & Q. standard grates and smokestack, the steaming qualities were improved, but a serious leak, caused by a lamination underneath a patch on one of the firebox sheets, became so troublesome that the engine was sent home to have the defective sheet replaced with a good one. The C., B. & Q. stack and grates were not removed, and the tests as originally intended will now probably be carried out, as the engine is again ready for service.

Communications.

Why Staybolts Break.

Editor National Car and Locomotive Builder:

A little space please, for a reply to a communication made by Mr. J. T. Connelly in your issue of February last.

Allow me to say that irony and sarcasm are not his peculiar charms; and his sneering manner of expressing himself does not improve his wisdom. I thought when I wrote to the NATIONAL CAR AND LOCOMOTIVE BUILDER on "Why Staybolts Break in Locomotive Fireboxes," I would have heard something from the mechanical world of great America in the form of a gentlemanly reply to a very important question. Instead of which a person who calls himself J. T. Connelly tries to jumble my statement into a complete lot of humbug, and calls it "unmitigated nonsense." Now I have not the very faintest idea who or what this gentleman is, but I suppose he must be some great luminary in the mechanical world, as he is so very confident in *his* judgment of what staybolts are and how they ought to be made and put in, and that he knows everything connected with boiler construction and management, and nobody else need trouble themselves about the matter.

Mr. J. T. C. says the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER will thank him for undertaking to expose what he calls the rank injustice to such a body of intelligent men as the locomotive engineers of America are. I, nevertheless, still maintain my views respecting the incompetency of a very great many locomotive drivers, and if Mr. J. T. C. is naive enough to fancy that *all* engine drivers are models of intelligence he makes a grand mistake, for it is well enough known that there are men driving locomotives who will not learn to manage them properly if they were on the footplate 50 years, either in America or elsewhere. Any roundhouse foreman will enlighten Mr. C. on this matter. No one has more respect for or sympathy with engine drivers as a body than myself, however Mr. C. may try to make it appear otherwise. He says that I would be more at home on the footplate, but I am out of my relations writing on boiler construction and management. I am very happy to state that I was at home on the footplate managing locomotive boilers over 20 years both in and out of England, and I do not believe that a college education is at all necessary to construct a locomotive boiler. I have seen them constructed and built by men who have never seen the inside of a technical institution in their lives, and those boilers did their work splendidly for a great number of years, working heavy traffic with high pressures and under many disadvantages besides; in fact, far beyond what some boilers of the present can do that are constructed by gentlemen who believe they have every qualification on these matters. So Mr. C. need not puff himself out so much on boiler construction. He further states that I have utterly mistaken his object and meaning. I hardly think so, nor do I believe most of the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER have mistaken him much when he writes about putting the staybolts in with proper size and tightness then there would be no more trouble, and I really do not think that he has set up any theory at all on the construction and management of boilers, for I doubt very much from his statements if he knows anything about either the one or the other. Anyhow he has not yet told us "Why staybolts break," or even advanced the theory beyond that absurdity of putting them in with proper size and tightness.

Let us suppose that staybolts are put in according to the M. M's. practice, than on Mr. Connelly's authority they ought to stand, but they do not. Why so? Because they are called upon to bear shocks and strains not calculated on when the M. M's rules were laid down, and I have clearly enough pointed out where and how some of these shocks take place. Mr. C. should not be over-confident in himself when he says I do not know or understand what I am writing about. If *he* does not understand it, that's his fault. Let him ask any intelligent driver and he will very soon tell Mr. C. something which may surprise him.

In my former reply to Mr. C. I asked him if he had ever been on the footplate of an express engine running at full speed (60 miles an hour) on a dark night when such a thing as a danger signal was suddenly thrown before the driver, if so, and he had seen what then takes place in the boiler when the brakes are applied to their full capacity, and the engine and train suddenly stops he would most certainly understand what I wrote about. If not it would be wise on his part not to say anything about impossibilities. As Mr. C. does not mention anything about this question one may safely conclude he has never seen anything of the kind and therefore his sarcastic mention of unmitigated nonsense falls back upon himself.

Mr. C. wants to know how it happens that the direct action of the water leaves the front head uninjured and that the reaction which is *spent force* breaks the stays. For answer to this question I would suggest that Mr. C., if he has any influence with the locomotive authorities where he is domiciled, try to induce them to let him try the experiment. It would, no doubt, be very interesting to the mechanical minds to whom he refers, and to convince Mr. C. how ridiculous he can make himself by talking about impossibilities and nonsense. The experiment I would suggest is: Get a train up to a speed of 40 to 60 miles an hour and then apply the brakes at full power. Keep them on without release until the train is stopped with a jerk—as it would be by intelligent drivers on dangerous occasions, and by non-intelligent ones every day when they gallop into stations when no mechanical officers are about. I fancy that Mr. C. and other mechanical minds will learn something they did not know before. I would advise to take an engine with a very strong boiler to make the experiment with, or else the results may prove disastrous enough for the experimenters. Among other things Mr. C. will be able to see that the recoil of the water, on stopping, does not go through the form of two right angles, as he says, but straight as a cannon shot from front to back. And then look out for consequences. Your correspondent in his jocularity says if I can frighten those who put heads on staybolts I would do more good than I claim with ignorant engine drivers.

I think that Mr. C. gets a little out of his latitude when he says that heads on stays are no good. I believe the generality of people know a stay with a head on has increased holding power, but not so your correspondent. And as to his very lucid ideas on hollow stays—well, we would rather leave the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER to settle that matter themselves; and if boiler makers find them in their judgment to be of the first importance they will no doubt adopt them.

Your correspondent mentions my declamations in praise of myself as being common to my kind. Well, I will ask the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER to accept it as such if to have frightened a few thick-skulled engine drivers out of a very dangerous practice may be denominated self-praise.

To conclude, it is clearly evident that your correspondent is not the party to apply to for information on the breaking of staybolts, therefore I will suppose the subject to be dropped, and Mr. C. keep his opinions, and I mine. His letter reminds me of a refrain to Albert Chevelier's song:

"It ain't hexactly wot e sez
It's the nasty way e sez it."

G. BAILEY.

DENMARK, March 31, 1892.

Editor National Car and Locomotive Builder:

Through some unaccountable source the impression has gone abroad, that the car on the New York, Lake Erie & Western road, which was destroyed by explosion and fire, on the night of March 30, at New Portage, O., was equipped with the Frost dry carburetor system of car lighting. This is not so, as the Erie road uses the Pintsch compressed gas oil system, and the explosion and fire were caused by that system of car lighting, and not by ours, as has been freely circulated among railroad men in general, for reasons best known to those who are interested in the circulation of such a report.

Such a thing as an explosion with the Frost dry carburetor system has never been known, as with this system it is an impossibility for such an accident to occur.

Yours very truly,
THE RAILROAD LIGHTING AND MF'G CO.

Editor National Car and Locomotive Builder:

Please submit this question to the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER. What is the proper interpretation of Rule No. 2 of the Rules of Interchange, which reads: "Cars must be delivered in good running order, and returned in as good general condition as when received"? Would that require a road receiving the car to make notation of all old defects and give the delivery road a copy? If receiving road did not give delivering road a notation of all old defects, then could such road reject the car on return when not gone longer than a week?

H. H.

Passenger Car Head Linings.*

For the past ten years wood ceilings for passenger cars have been generally adopted, and more particularly on the new cars turned out from manufacturing shops. The first were put up, we believe, by the Pullman Company in their sleeping and parlor cars, and it was but a short time before the supply car shops followed and commenced putting up wood linings, so that to-day a great majority of the new cars built are finished with the wood ceiling, and it is a question that we think will bear discussion whether it was a stroke of economy in adopting the wood finish in place of the heavy cotton sheeting head lining which has done such good service in years gone by.

There are many serious objections to the wood over head in a passenger car which we propose to touch on in a general way. The expense to start with is three times what the sheeting would be and its great weight makes the coach top heavy. An ordinary or common length of a car is 50 feet, and this is burdened with the addition of about 600 pounds of dead weight, allowing the veneered wood that is used generally to be one-quarter of an inch in thickness. Now, the weight may not be the most objectionable feature, that may not be so serious a matter, but allow us to point out others that we think are sufficient to make railway companies call a halt in the matter of wood linings, and more especially in the ordinary passenger coach. They may do very well in a sleeper or dining car or in a coach that is well taken care of, as the Pullman and Wagner drawing-room cars are, these being fitted mostly with the Pintsch gas system of lighting and the heater placed in such a position in the car that there can be no damage to the lining from this source.

The writer has perhaps had as great an experience with the cotton cloth linings as most car painters, having been painting them for over twenty years. There were two linings painted and put up in new cars on this road in 1874 that were still in fair condition until within the past year, when the car bodies were harrowed off which made it necessary to paint new ones, otherwise they would have done good service some time longer. All the passenger cars on the road, with the exception of two, have the cloth linings, and our two officers' cars, built at these shops, have cloth also, and many of them have been in service from ten to fifteen years, and are looking remarkably well for the time they have been out.

When a cloth lining is painted properly and put up in the car that is the last of it. Very little expense is required to keep it looking well, but not so with the wood, for I have seen very few but what in three or four years had become lifeless and dead, and when the car came in for repainting or varnishing the wood lining had to be well cut down with sandpaper, new filling given to it and three coats of varnish applied, and again rubbed down, costing more to finish than it did when first put up for both labor and material, as it has to be done in the car, while the wood lining when new is finished before being put in. Our cotton cloth lining is also painted and decorated before being put up in the car. The three thicknesses of wood glued together does not hold a finish as well as a solid piece of wood will. Evidence of this fact may be had by examining the inside finish, the glue undoubtedly being one cause for its decay, and we believe the principal cause, but there are other enemies to a wood ceiling of which we shall speak and one is dampness from the outside which often works through the entire ceiling and the wood becomes separated, and warping and splitting is often the result. The heat on the inside of the car in cold weather, which is obtained either from steam or from the stoves and Baker heaters, is injurious, and far more so than it is on the cloth lining as the veneered work of the wood lining being full of the hard glue the elasticity is destroyed and it does not expand and contract without checking, as a cotton lining will. The two wood linings we have to care for on this road, I have found it necessary to rub down close with sand-paper and refill the surface on the clear-story of the car when they had been in service but four years, although I had cleaned and oiled them several times. When the car came in for revarnishing on the outside one of these was furnished us in the raw wood and was filled and finished in the shop with three coats of body rubbing varnish and rubbed down and oiled, but in four years it was dry and the surface was open and porous while the other hardwood finish on the car was in good condition, and polishing it over with raw linseed oil and oo pumice stone was all that it required to restore its original finish after four years of service on the road. Wood ceilings are also liable to warp badly during the extreme heat of the summer months, and more especially so in the southern climate, and when standing in yards exposed to the hot sun which beats down on the car roof. There is nothing more severe on the wood lining than such exposure, but not so on the cotton lining, as this being so light and having more elasticity it does not hold or draw the heat as a heavy body will.

Another trouble we have to contend with is the drying out of the wood ceilings near the stoves or heater in the winter, also the lamp panels in the clearstory of the car are ruined by the heat and smoke from that source, and not only is the life burned out of the varnish, but the veneer is split up badly from the excessive heat, as there is very little, if any, expansion and contraction in a veneered panel no matter where it is exposed without the finished surface showing the damaging effects of it, as any woods that are glued together, and particularly three thicknesses of them will not have that elasticity that a solid or single piece of wood will as the fibers are held firmly together with the glue. This, we are convinced, is the cause of veneered linings giving out so quickly around the lamp centers and stoves in the car.

To convince any one of the fact that heat is the principal cause of the veneer giving out we find that the side lining, which is also veneered wood, is in far better condition than the lining in the clearstory, as it is not so much exposed to the heat either from the outside or inside, and the only bad spots we find in it are around the stoves in the corners of the car, so that the dome lining requires attention and a coat of varnish applied occasionally if you would have it in good condition and equal to the side lining which only needs cleaning up and oiling as often as the body finish of the car.

* By Robert McKeon, in *Painting and Decorating.*

The Peary relief expedition, under the auspices of the Philadelphia Academy of Natural Sciences, will start for McCormick Bay, Greenland, early in the summer.

It is reported that a resolution is to be presented in the United States Senate which will place the whole matter of the adoption of safety appliances on railroads in a position to adjust itself as the interests of the roads and public sentiment demand. The resolution, as described, simply provides for full publicity by means of annual statistics of couplers and brakes, to be published by the Interstate Commerce Commission; and it is intended to kill all pending bills on safety appliance legislation.

Locomotives for Chicago & South Side Elevated Railroad.

Mention was made and a slight description given in the National Car and Locomotive Builder for February of the compound locomotives being built by the Baldwin Locomotive Works for the Chicago & South Side Elevated Railroad. The 20 engines ordered are now completed. The general outline is shown in the accompanying illustration.

These engines are essentially of the Forney type, and were designed by Mr. D. L. Barnes, consulting engineer of the "Alley" road, and an endeavor has been made to make them as efficient as possible for the work they will have to do, and as convenient to operate as possible. Particular care has been taken to cause them to be as little of an annoyance to the public as possible, and to this end a muffled safety valve and exhaust is adopted, and every provision made to prevent oil and water from dripping on the streets. The general dimensions are as follows:

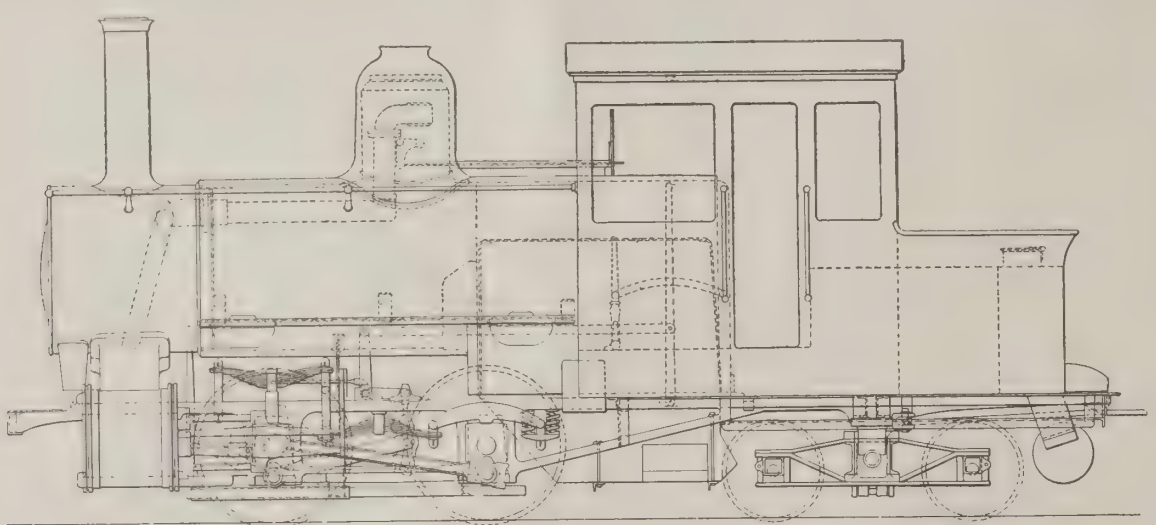
Cylinders (compound), 9 and 15 × 16 in.
Boiler, straight top, 46 in. in diameter.
Firebox, 64 × 44 in.
Flues, 167, 1¾ in., 76 in. long.
Grates, suitable for bituminous, anthracite or slack coal.
Truck wheels, 26 in. in diameter.
Weight in working order, 56,000 lbs.
Weight on drivers, 40,000 lbs.
Driving wheels, 42 in. in diameter.
Driving-wheel base, 60 in.

As before stated, the frames are of wrought iron in one piece, and are made unusually heavy to avoid previously experienced trouble with this type of engine in elevated service from broken frames and loose frame joints. The driving wheels and truck wheels are of wrought iron of Vauclain design.

The boilers are of the radial stay type, and designed to carry 200 pounds working pressure, and have asbestos lagging. The injectors are Mack & Nathan, with inside injector checks. The engines are equipped with steel cabs, Westinghouse air brake, pressed steel casings and smoke-box doors, the Gold continuous car-heating system, metallic packing for pistons and valve stems, and sand boxes for both front and back drivers.

The Baldwin Locomotive Works have in these engines made a special effort to meet all the specifications and to construct what they expect will prove the most durable elevated engine ever built. The heating surface of the firebox and the grate area are unusually large, and it may be that a cheap grade of anthracite fuel can be used. The dome is attached to the boiler by a heavy pressed steel base, as shown. The boiler sheets and the dome sheets are not flanged, but each is riveted to the flange ring. The firebox sheets are guaranteed for five years against laminations, on the theory that if lamination does not exist when the sheets are made it will not occur afterward.

It is expected the road will be in operation by July 1.



LOCOMOTIVE FOR CHICAGO ELEVATED RAILROAD.

Technical Education.*

The principal work of a technical school is the teaching of science, and not, as many suppose, to turn out full fledged engineers, architects, manufacturers and tradesmen; all that it can pretend to do is to turn out partially educated men. The graduates must supplement the work in the school by practical experience in after life before they acquire the right to call themselves practical men.

The practical work of the school differs in many respects from the practical work of actual life, even in work of the same kind, as, for instance, drawing, designing, the use of surveying instruments, lathe work, smith work, etc., yet the feeling of reality and responsibility is lacking. It is a very different thing to make mistakes in school work from making mistakes in similar work in actual life. A man is vastly more impressed by the necessary punishment which follows mistakes in the serious business of life than he can be by the arbitrary penalties instituted by the faculty.

Again there is a great body of knowledge necessary to complete a man's practical education, which it would be only an utter loss of time to attempt to give in a school, simply because there are no well-defined threads of scientific thought upon which to string it. Three-quarters of the information to be found in an engineers' hand-book would be useless in the curriculum, although all-important in practice. Such knowledge becomes useful only when impressed by experience.

The establishment of engineering laboratories marks a new departure in technical education. Surely, it will be said, the work in these laboratories is practical. So it is, but not perhaps in the sense in which the question is put. The steam engine in an engineering laboratory is not used for the same purpose as the factory engine. In the shop it is used for manufacturing purposes; it is placed in the laboratory for the purpose of being experimented upon. In the laboratory it is tried at different speeds, worked condensing and non-condensing, with varying steam pressures, with and without steam jacketing, with different amounts of lead and cushioning, with different counterbalances for crank and connecting rod, with varying clearances, with simple and multiple expansion.

The work done at the main shaft is accurately measured; likewise the work in the cylinder—the feed water and condensing water are weighed—the degree of dryness of the steam determined. In short, in the laboratory all the conditions which may affect actual practice are experimentally investigated. It is only in this way that the principles governing the construction and action of engines can be fully determined.

What would an employer do with a man who should attempt any such work with the factory engine? He would simply give him to understand that his usefulness was gone, and that he had better look for employment at the School of Practical Science.

*Abstract from address by Prof. Galbraith before the Toronto School of Practical Science.

Wild Sport.—Newly Arrived Visitor—What do you do here in the evenings? Country Host—We go and watch the 8:30 express pass.—*Harper's Bazar.*

Hodges' Steel Car.

The accompanying illustrations show plans for the construction of a steel car prepared by Mr. H. C. Hodges, President of the Detroit Lubricator Company. In the drawings Fig. 1 is an elevation of a car 70 feet in length built to carry through freight; Fig. 2 shows one end of a floor-frame, showing sills and the manner of connecting studding to the sills; Fig. 2*a* shows a corner detail; Fig. 3 shows a cross-tie and brace detail; Fig. 4 shows in section the fastening of a stud to the side sill; Fig. 5 shows a connecting fillet; Fig. 6 shows in detail the fastening of the cross-tie to the middle sills; Fig. 7 is a sectional elevation of a portion of a car, the figure representing two of the three trucks upon which the car rides; Fig. 8 is a plan view showing at different parts of the figure the roof, the roof-frame, the floor-sills, and continuous draw-bar.

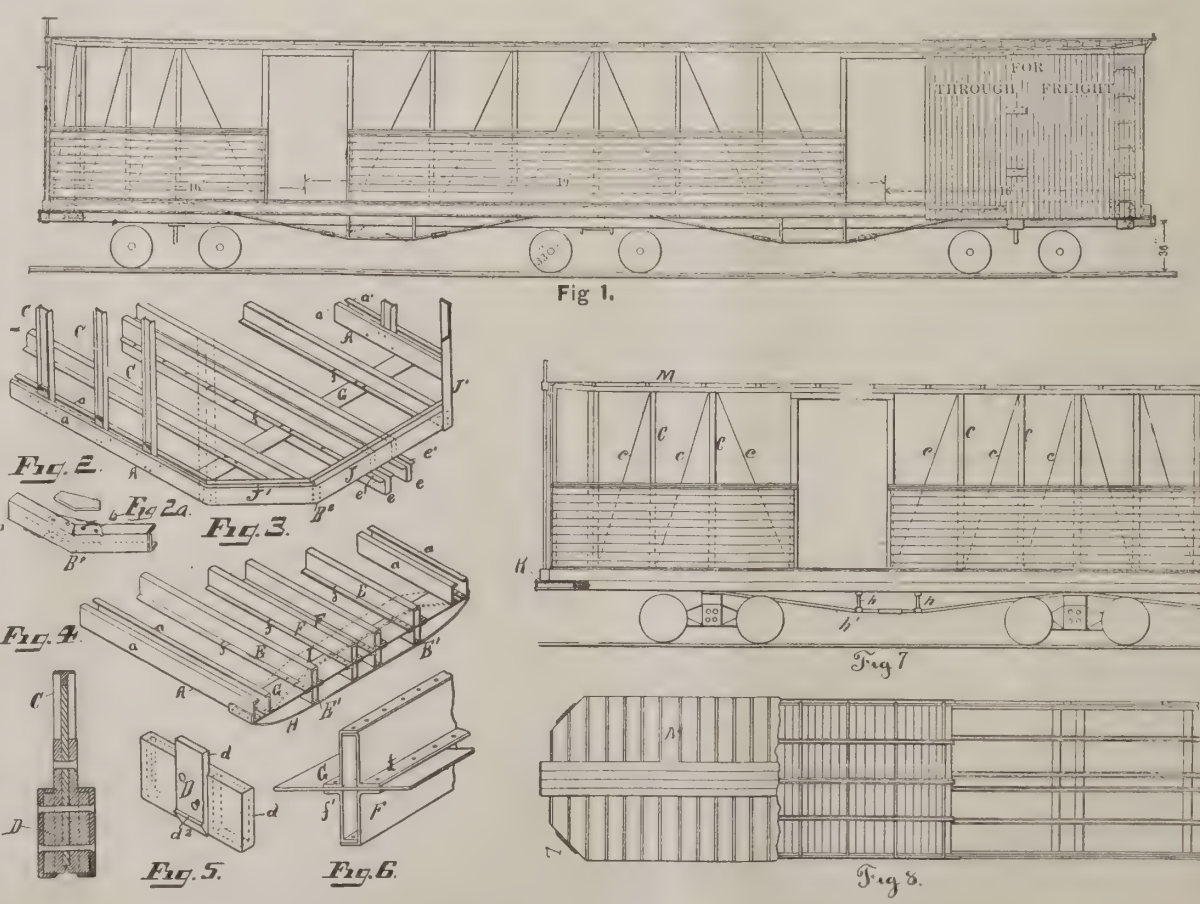
This method of car construction has for its object the construction of cars, both passenger and freight, of greater length, strength and carrying capacity than those now in use, without a corresponding increase in weight. This is accomplished by the use of a metal frame throughout, made up in the following manner: The side sills are formed by two steel channel-bars with their concave faces toward each other. The uprights are also channel steel, and are secured to the side sills by interposed cross-filling blocks (malleable iron), with the horizontal arm embedded within the channel of the side sill, and the vertical arm within the channel of the upright. It will be seen that when this joint has been completed, each part has a bearing against another part, and the bolts or rivets holding these parts together are relieved of all strain or shear. The center sills are compound channel or Z-bars, with crossed tie-plates placed between the flanges of the upper and lower members, also additional tie plates extending above and below the central sills, and all secured to the side sills. The double central middle sills are rectangular in form, with middle flanges on either side, and are made continuous, extending from end to end, the lower halves passing under and beyond the end sills, thus forming a continuous drawbar made integral with the car frame, and to which the drawbars are attached. The end of the car is preferably made octagon or bay shape. The end sills are formed by uniting two channel or angle plates with flanges overlapping in cross section, thus producing a double webbed adjustable channel into which the ends of the longitudinal sills are placed and securely clamped. The corners of the car are formed by angle plates overlapping, and secured to the side and end sills, and this also forms the corner upright, making a simple and strong combination at these points. By making the ends of the car octagon or bay shape, great additional strength is secured, with no perceptible loss in carrying capacity, and accidents incident to car coupling are practically avoided.

The sides, ends, floor and lining are to be of wood. The roof is constructed of No. 22 corrugated steel plates of double thickness at each corrugation. The purlins are U shaped, and extend the entire length of the roof, with their concavities face to face with the roof channels, and are secured thereto by intermediate malleable iron filling blocks at each intersection.

There will be three trucks under this car, the frames made up wholly of steel shapes, the center truck being of the equalizing type, and provided with an anti-friction parallel side motion of simple design, and capable of adjusting itself to any curve in use on trunk lines. In cases where freight cars are of more than ordinary length, there may be two doors, located the same distance from the ends as on ordinary cars, thus giving every facility for loading and unloading that now exists with the common car. This plan is illustrated in Fig. 1.

Estimates relative to the cost of this construction show that it will but little exceed that of wooden cars per tonnage capacity. With slight modifications, the same methods can be applied in the construction of passenger cars, mail and express cars, and when so constructed, it is claimed that these cars will be practically invulnerable against fire and many other casualties, thereby saving loss of property and sacrifices of human lives incident to the present system of car construction, and these results can be obtained at a cost less than that of the cars actually in use.

The steel used in construction is of shapes easily rolled, and in fact commonly found on sale, so that few or no special shapes will be required in building it. While Mr. Hodges believes in the use of the long car for through business, his system of construction may be readily applied to cars of any size.



HODGES' STEEL FREIGHT CAR.

Many rumors concerning the troubles of the employés of the roads comprising the Reading system are in circulation.

The Philadelphia & Reading has been reducing its forces at several points. The car shops at Wilkesbarre has been ordered to run on half time.

The American Railway Association.

The spring meeting of this association was held in New York City April 13. The date fixed for the spring change of time tables is May 15.

The Committee on Car Service made a report recommending the adoption for one year from July 1 next of half a cent. a mile and six cents a day as the charge for freight cars interchanged. The committee proposed that line cars, which constitute the bulk of those which are held away from home in large numbers for grain or other special traffic, be exempted from the per diem charge, the half cent a mile to be the only compensation for these cars. It was recommended that the rate on private cars be reduced to half a cent a mile without per diem. A code of rules to prevent the misuse and diversion of freight cars was also proposed, embodying a penalty of $1 for each car diverted.

Action on the report was postponed until the next meeting.

The Committee on Train Rules made a report on the 24 hour notation, or "24 o'clock system." Circulars had been sent out and replies received from over 100 members, but the committee did not find sufficient encouragement to propose any action. About 42,000 miles of road were in favor of the system, as against 36,000 opposed, but some of the largest roads made unfavorable or conditional answers, and only 16,000 miles are ready to adopt the system on Oct. 12 next, as was proposed.

This committee received a large number of suggestions concerning the Standard Code, and has taken up the subject of interlocking and the block system, but has not seen its way clear to make a report. The committee proposes that a special session of the Association be held in Chicago this summer to specially consider train rules, signals, etc.

The subject of interlocking switches and signals and block systems are to be taken up by this committee and the Safety Appliances Committee, acting together.

The Committee on Safety Appliances made a report on power brakes. Circulars had been issued and were answered by 100 members, operating about 86,000 miles of road. The committee recommended action by the Association according to the following "conclusions," and the report was adopted, so these principles may be regarded as those of the Association.

The best practice indicates—

1. That every truck wheel under each car in passenger train service should be braked.
2. That brakes should be so arranged that they can be applied not only from the locomotive but from each car in the train.
3. That the conductor's valve should be within control throughout the length of the car.
4. That the conductor's valve should be self-closing.
5. That 90 per cent. of the total empty weight of a car in passenger service should be used in estimating the braking power, and 70 per cent. of the total empty weight of a freight car.
6. That locomotives for each description of service should be equipped with power brakes applied to every wheel of both locomotive and tender, save the locomotive truck wheels, whether the cars of the train are equipped with power brakes or not.
7. That all cars on freight trains should be equipped with power brakes, and that the power brakes on all the cars of the train should be made use of.
8. That the driving-wheel brakes should be used habitually, and both locomotive and train brakes controlled by a single simultaneous motion of the engineer.

The use of the Westinghouse air brake largely predominates. The committee therefore regard it as exceedingly important, if not essential, that any other system used should be interchangeable and equally efficient in all respects with the Westinghouse system.

The committee recommended that all locomotives hereafter constructed should be equipped with power brakes applied to every wheel except the engine truck wheels, and it submitted the following statement made up from the replies of 100 roads to a circular.

FREIGHT CARS IN SERVICE FITTED WITH M. C. B. TYPE AUTOMATIC CAR COUPLERS.

	100 roads.	21 transportation co's.	Total No. cars.
Jan. 1, 1887	6,341	78	6,419
" 1888	9,981	1,188	11,169
" 1889	20,070	2,322	22,392
" 1890	42,019	6,234	48,253
" 1891	76,548	8,948	85,496
" 1892	118,406	16,678	135,084
Since Jan. 1, 1892	1,793	25	1,818
Additional cars under construction or contract Feb. 15, 1892	25,035	1,574	26,609

According to the replies to the committee's brake circular six roads believe it unnecessary to brake every wheel of a six-wheeled truck under a passenger car. Connecting the conductor's brake valve in passenger cars to a cord running the whole length of the car is approved by 77 roads and disapproved by 18. Sixty roads, owning 12,000 cars, would have the conductor's brake valve self-closing; 29 roads, with 6,000 cars, would not. Roads owning 11,000 passenger cars would make the brake power 90 per cent. of the empty weight, but 10 roads advocate 80 per cent. and eight roads 70 per cent. There are 237 passenger engines reported to be without power brakes. Approximately four-fifths of the passenger engines reported have driver brakes.

All but one of the roads replying consider it desirable to have a power brake on freight engines, even if there is no power brake on the train. Of 13,000 freight engines reported 10,000 are equipped with power brakes, but only 6,300 of these have brakes on the drivers. Ninety-six roads report 772,165 freight cars, of which 91,914 have power brakes. Eighty-nine of the 96 roads replying advocate using the driving-wheel brake habitually, and 83 of them say that this brake and the train brake should be operated by the same lever.

The following officers were re-elected: President, H. S. Haines; First Vice-President, Lucius Tuttle; Second Vice-President, E. B. Thomas,

Western Railway Club.

At the March meeting Mr. J. N. Barr, the Chairman of the Committee on Revision of Code of Rules of Interchange, adopted by the Master Car Builders' Association, June, 1891, read the report of the committee. It is given below and after each recommendation is given in parenthesis the action of the club in regard to it.

Your committee, appointed to make suggestions as to the revision of the Rules of Interchange of the Master Car Builders' Association, begs leave to report as follows:

Rule 3 provides that cars may be refused for any of the following defects: In enumerating these defects for which cars may be refused, there is no provision made for defective axles, except in Sections "N," "O" and "P." In addition to those enumerated, there are two defects in axles which are of quite a serious character, *i. e.*, the formation of seams on account of badly welded material, and the destruction of the fillet at the inside of the journal. If this fillet is cut to a sharp corner, the axle is exceedingly liable to break and should be scraped. We would therefore recommend that in Rule 3, Section O, a clause be added providing for cases in which axles have bad seams or which have the inside fillet worn to a sharp corner. (Approved)

In section "S" of rule 3, "Brakes in bad order," there are 23 conditions mentioned which must be complied with. Your committee would recommend that these 23 conditions be omitted, and the following substituted therefor: "Brakes should be considered in bad order unless all parts are sound, in good condition, properly secured and in good working order, with the brake shoes at least ⅝ inch thick at the center, and with all attachments at least 2½ inches above the top of the rail." (Approved.)

In section "T" of rule 3, "steps, ladders or running boards in bad order or insecurely fastened," your committee would recommend that the two explanatory sections be omitted, as they simply reiterate what is said above. (Approved.

In section "U," "drawbars and attachments in bad order," it is recommended that the nine conditions, which are merely explanatory, be omitted. (Approved.)

[Attention was called to the improper reading of sections Y 2, Y 3, Y 4, Y 5 and Y 6 of rule 3, in connection with the rule itself.]

A careful reconsideration of Rule 8 is recommended, the committee not feeling prepared at present to make specific recommendations. (Discussion of the rule led to a recommendation to strike out clauses "b" and "c.")

In Rule 9, under the head of axles, your committee would recommend that Section "B," which now reads "Axles bent or broken, or with collars worn off under fair usage," be modified so as to read "Axles bent or broken with collars worn off, fillet at inside of journal worn away or seamy journals." (Approved.)

Under Rule 12 it is recommended that the following changes be made in the prices of wheels and axles:

	NEW.	2D HAND.	SCRAP.
One 36-inch wheel	$12.00	$8.00	$5.00
One 33-inch wheel	9.00	6.00	4.50
One 30-inch wheel (or less)	7.50	5.50	4.00
One axle, 60,000 lbs	10.00	6.00	4.00
One axle, 40,000 lbs	8.00	5.00	3.50

(Approved.)

Under Rule 26 it is recommended that the charge for steel castings be modified. That prices be made for drawbars of M. C. B. make, and that a credit be made for good M. C. B. drawbars which are removed on account of not being standard to the car. It is the opinion of this committee that these drawbars, when removed and in good condition, should not be credited merely at the price of malleable iron scrap. (Approved.)

Your committee would recommend that Rule 30 be so modified as to authorize the Arbitration Committee, or Committee on Revision of Rules, to decide cases on the basis of equity as well as under the rules. (Approved.)

It is also recommended that a rule be introduced requiring that no bill shall be made on a bad order card unless the repairs are actually made. (Approved.)

We also recommend that a careful consideration of the question of doing partial repairs on a bad order card be considered and a mode of procedure be definitely settled upon. (No action.)

As the matter of carding for old defects is creating a great deal of delay and trouble in interchange of cars, it is recommended that a rule be inserted requiring that old defects shall not be carded for, except by the owners of the car. It is the opinion of the committee that this is perfectly equitable, as the object of the bad order cards has been to cover any damage which is done to the car and to make the road causing the damage responsible. The card seems, however, to have been diverted from its original purpose and now has degenerated into a means of making roads chargeable for many defects for which they are evidently in no way responsible. (No action taken.)

In discussing Rule 8 President Peck stated that there ought to be a provision made for springs also. There are some companies buying very poor springs. If they were made responsible they would employ a little better material. Making owners responsible for draft springs would do nobody an injustice

Mr. Barr said that the commitee was not unanimous, although the majority favored letting the rule be the same as it was last year.

The Central Railway Club.

The Committee on Steel Trucks, appointed at the previous meeting to gather information in regard to the Fox pressed steel truck, reported that very little information could be found, as the trucks had not been in service long enough to demonstrate their worth. The committee recommended that all who could should put a few sets in service.

Mr. Chamberlain suggested the use of malleable iron oil boxes, and urged the use of malleable iron center plates in preference to pressed steel or cast iron.

Mr. Robson thought the malleable box would wear too fast against the steel jaw of the truck.

Mr. Dolbeer thought there was not a great deal of difference in the wear of malleable and gray iron, but would prefer a malleable box at the same cost. He did not think the weight of the malleable box could be sufficiently reduced to overcome the difference in cost per pound.

Mr. Mackenzie remarked that malleable iron boxes had been used successfully by street railroad companies for years, and he was willing to give them a trial if he could get manufacturers to make them.

It was voted to recommend that the labor items of sections B and C in Rule 8 be eliminated.

The President called attention to a desired change in the present time of the meetings so as to make it a week earlier, and recommended printing the constitution and by-laws of the club, with a list of the members, and the publication of the proceedings in pamphlet form.

The recommendation in regard to the constitution and by-laws and the proceedings was adopted; and it was resolved to hold the next meeting on the fourth Wednesday in April instead of May for the consideration of amendments to the interchange rules to be recommended to the Arbitration Committee of the M. C. B. Association.

Material for M. C. B. Couplers.

At the March meeting of the Western Railway Club considerable discussion was indulged in upon the relative merits of malleable iron and cast steel for the M. C. B. type of coupler, suggested by a paper read upon the subject at the previous meeting by Mr. William Forsyth, in which it was held that cast steel was the best material, as tests had demonstrated malleable iron castings to have a tensile strength of less than 30,000 pounds with practically no elongation, and steel castings to have a tensile strength of 60,000 to 70,000 pounds and an elongation of 15 to 20 per cent. in eight inches.

Mr. Townsend said that there were about 800 M. C. B. couplers in use upon the Chicago & Alton road, and that all were of malleable iron, and during a test of link and pin drawheads conducted some time ago one blow of the hammer broke the iron head, three blows broke the cast steel head, and it took 33 blows to break the malleable iron head.

Mr. Barr: To tell the truth, I don't know anything about the relative value of the two metals for M. C. B. couplers. If we put steel to a shop test, we of course get very much better results than can be obtained from malleable iron. The same may be said of steel axles or steel staybolts, but I think anyone in the room here that has had two or three years' experience with steel staybolts would say that they would prefer not to be guided by the preliminary tests of the material. There is a difference of opinion as to the relative merits of steel and iron axles, but I am inclined to think that I have got the data that warrants me in favoring the iron axle. Now when we turn to the drawbars, we find the tests show very decidedly in favor of steel. But the question in my mind is, are those tests comprehensive enough? Do they duplicate the different strains and shocks that a drawbar is exposed to in actual service in such way as to enable us to prophecy as to what it will do on the road? Is the data we get from mere tests of the strength sufficient to warrant us in saying "This is the material of which to make a drawbar?" I am inclined to question it.

Mr. Forsyth: Since our last meeting we have seen the result of some experiments which show incidentally the effect of the buffer block. At the recent brake test at Burlington, the couplers were not protected by buffers, and we broke a number of bars and knuckles there when making stops. At the Lehigh Valley test they were protected by buffers and no breakages of this kind were reported. This, I think, is a good argument for the use of buffers. I believe that the breakage of the arms, mentioned to-day, would be largely reduced if the coupler was protected by buffers. The question raised in regard to the failure of the knuckle and the tail bolt has only reference to the tensile resistance of each, but the fact is that most of these breakages are caused by blows delivered in the opposite direction, and if you make the knuckle so weak that it will break first, you will be troubled continually by broken knuckles, as we have in the past.

I hope that all my friends among the malleable iron coupler people will understand that this paper and the points made in it adverse to malleable iron do not arise from any personal antagonism of mine to the material or to their interests. I look at the matter purely from an engineering point of view. The fact that the use of steel promises much in the way of strong castings, is shown by the fact that the government is using them largely and their severe specifications are met in castings which are made for them. The locomotive builders are also using many steel castings. You will find that the demand is growing in all directions. Not only for knuckles and drawbars, but in every place where we want a cast metal to meet a severe resistance, it seems best to use steel, and it was simply this that led me to advocate it for the use of couplers.

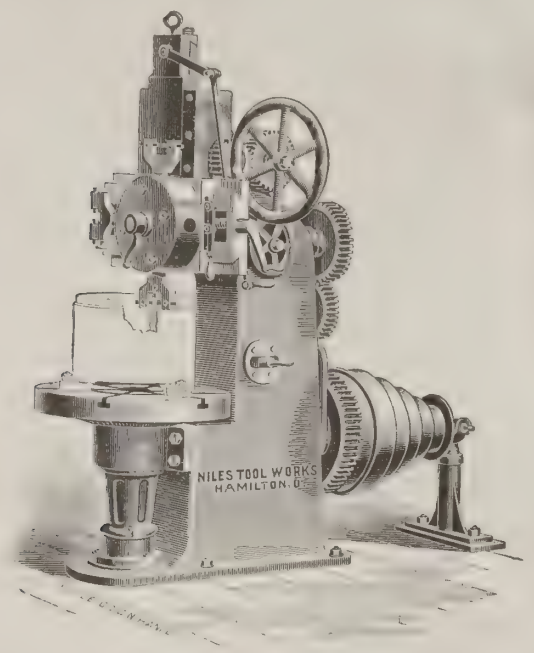
Combined Turret Boring and Turning Machine.

The illustration represents a turret machine recently brought out by the Niles Tool Works, of Hamilton, O., for general boring and turning of small work, and for the special duty of turning piston rings for locomotives or other steam engines, the turret principle being employed to bring into successive action the different tools necessary to complete such rings.

The turret saddle is mounted upon a substantial cross rail fixed to a vertical slide in the column. The table is supported on a heavy spindle with large bearings, and receives motion through bevel gearing from a cone having five steps for a 4-inch belt. The cone is strongly back-geared, thus affordingten changes of speed for the table.

Four feeds by power are provided, the change from roughing to finishing cut being made instantly by means of a small lever projecting from side of column. Quick hand adjustments to facilitate setting are also provided.

In the illustration a casting for piston rings is shown in outline secured to the table, while the turret carries three special tools for finishing the rings without stopping. The tool standing upright in turret is for the first or roughing cut; it has two cutters which act on the inside and outside simultaneously to rapidly dispose of the stock and bring the ring approximately to size. The tool shown operating on the casting carries three cutters for finishing, one each for the



inside and outside of ring, while a third faces the top or edge, all at the same time. The third tool is for cutting the ring off; it has two cutters fed toward each other from the inside and outside of ring to complete the operation.

It will be seen that the machine has remarkable advantages for performing such work in duplication. When once set, the different tools can be made to perform their respective duties again and again, cutting up casting after casting into rings, and the work when done will be characterized by a degree of uniformity altogether beyond the reach of lathe or other ordinary methods.

This tool loses none of its advantages as a general boring and turning machine on account of its peculiar fitness for turning piston rings. Different cutting tools can be used in the turret for boring, turning and facing, and the wide range of speeds, available from the back geared cone, allows the machine to effect all these operations economically and well.

By means of a taper dowel, the turret is secured over center of table for boring with double ended cutters and for general chucking work.

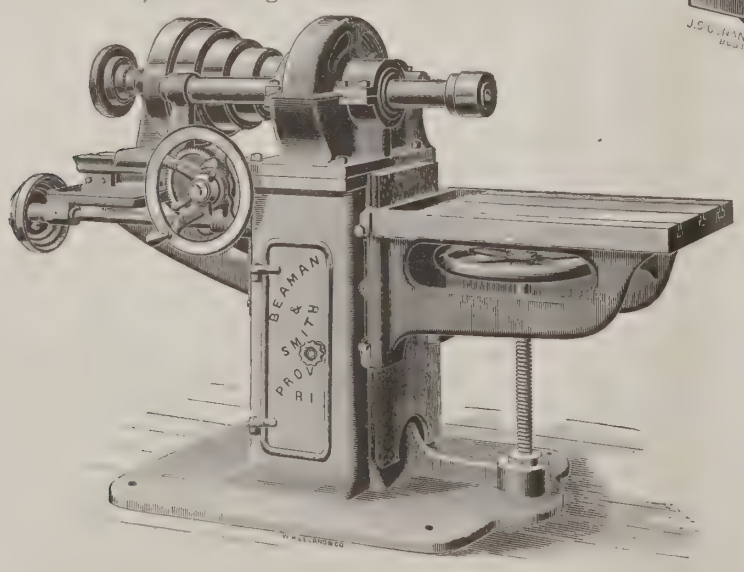
The machine will swing 31 inches in diameter, the table being 30 inches, and has a clearance under overhang of column of 18 inches, this height always being available for work, as the vertical slide allows an adjustment of the cutting tool to suit.

Standard Drilling and Boring Machine.

This machine is intended for drilling, boring and tapping a great variety of work for which a much more expensive tool would ordinarily be required. When desired it can be furnished with an outer bearing for boring bars, also with a cross table provided with longitudinal traverse.

This machine has shelves cast in making a convenient receptacle for tools, etc. It is provided with a large flange on the bottom, which is 3 feet by 4 feet, thus insuring a firm floor bearing. The knee or platen is 20 inches wide, 32 inches long, has three tee slots, is well braced, also supported by elevating screw 11 in. × 2 in., which is placed well out from standard with 18 inch hand wheel for adjustment. The bearing on standard is 16 inches, is gibbed and provided with binders for ridged fastening. The least distance from top of table to center of spindle is 2 inches, the greatest 24 inches.

The spindle is 3 inches in diameter, has taper hole for tools, bars or sockets, also driving slot across the end. It has 18



inch movement by hand or power and is driven by a 3-inch belt on a 5-section cone, 6 inches to 16 inches in diameter, is geared direct 3 to 1, and back geared 24 to 1, which gives 10 speeds from 2⅛ to 160 revolutions per minute. The gearing is protected by shields. The spindle quill has long conical ends running in taper boxes of hard bronze, with take up for wear.

The automatic feeds are 120, 80, 40 and 13½ revolutions of spindle to 1 inch of feed.

It is manufactured by Beaman & Smith, Providence, R. I., from whom all information respecting it can be obtained.

"Standard" Water Closet.

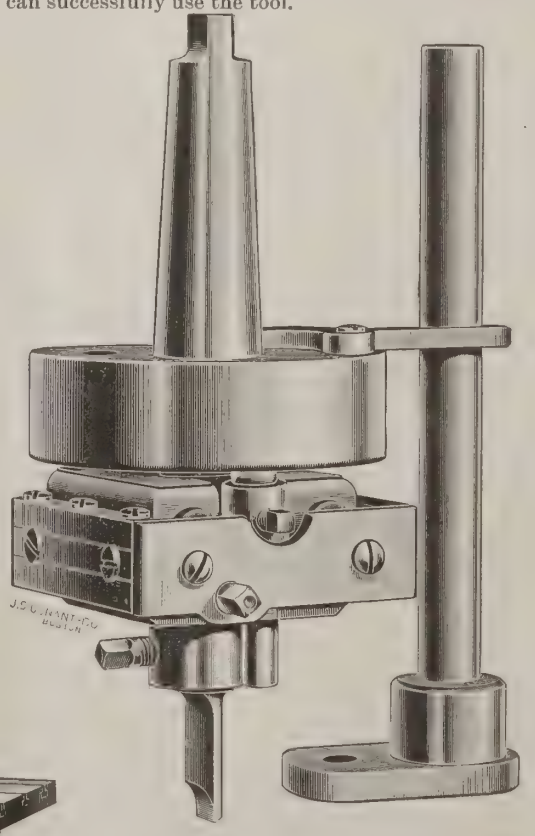
The "Standard" water closet for railway cars, which is illustrated herewith, and which is manufactured by the Henry C. Hart Manufacturing Company, of Detroit, Mich., is a practical solution of the question. Provision seems to be made in its construction for all contingencies, and its use for the last three years on different lines in all parts of the country, without a single complaint of its failure, proves it to be a perfect and reliable apparatus. Over 2,000 of these

closets are now in use, some of them having been run on sleeping cars regularly over routes extending into the northwestern Canadian districts during the past winter without ever freezing, and giving perfect satisfaction. It is entirely automatic in its action, the raising and lowering of the lid actuating all parts. As this is practically a very successful water closet for railway cars, we predict for the manufacturers a large sale of this article. They have made traveling more bearable than it has ever been, and will doubtless meet with the success that their merit deserves. The advertisement of the Henry C. Hart Manufacturing Company will be found on another page, and they solicit correspondence from interested parties on this subject.

Polygonal Boring and Turning Tool.

The accompanying cut illustrates a tool that may be attached to any drill press for boring any geometrical figure, such as round, square, hexagon octagon, triangle, diamond, star, oval, half-round, etc., etc.

It can be fitted to bore any shape of hole having straight sides, or curved sides, or both. Any machinist of ordinary ability can successfully use the tool.



It requires no more power than an ordinary drill and can be speeded the same as an ordinary drill.

Attached to a lathe, it will turn the perimeter of any geometrical shape or figure. The tool can be used to bore square and round, or hexagon and round, without change of parts. For counterboring round holes it is very useful, as the cutter can be adjusted from the center to bore any variation of size up to three inches, and instantly.

Practical machinists and tool makers will see the great saving in time such a tool will make in a shop; also that it will perform a class of work heretofore only possible by hand, and generally too expensive to be satisfactory. For the general trade the tool is fitted to bore either square or hexagon, or both. We have seen some of the work done by this tool, and were surprised at the variety in the shapes of holes it was capable of boring. Manufactured by Larrabee Machinery Co., 105 Sumner St., Boston,

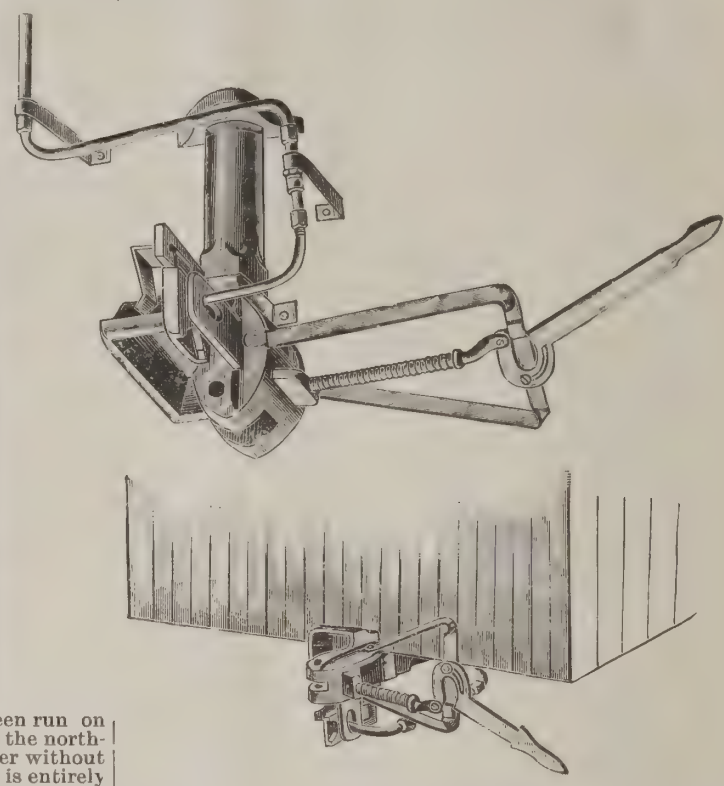
Combined Automatic Car and Air Pipe Coupler.

The accompanying cuts illustrate a combined automatic car and air pipe coupler, known as the Thomas coupler, manufactured by the Thomas Car Coupler System, St. Louis.

It is a complete automatic coupler, and dispenses with the rubber hose that is now in general use for connecting train pipes, and substitutes a continuous pipe connection provided with two flexible joints that yield readily to any varied motion occasioned by rounding a curve or by uneven track.

It combines the coupling of the air brakes with the drawheads, the valves opening when the drawheads couple and closing when they uncouple, thus rendering it unnecessary for a trainman to go between the cars in act of coupling or uncoupling.

It will couple on a curve of any given radius known in



railroad construction, even though an angle of 18 degrees is obtained by two cars in the act of coupling; also where there is a variation in the height of the drawbars as much as three inches.

An accidental uncoupling is impossible so long as the coupling pins are not continued in service till they are worn to a point of danger, and before they can reach this point the brakes are automatically applied bringing the train to a stop.

A number of these couplers have been in service on the St. Louis Merchants' Bridge Terminal lines for about three months without developing any flaws or defects. The manufacturers are preparing to make a series of tests with heavily loaded freight cars which will take place in a short time.

Work on the three-story, 166×56, extension of the Brown & Sharpe Manufacturing Co.'s No. 3 building, the stone foundations of which were laid last year, has been resumed, and it is expected that the structure will be ready for use in August or September. The principal object of the enlargement was to secure more room for storing patterns, 40,000 or more of which are in use, but space will be reserved on the first floor for bins for the molding sand brought from the North River, near Albany, N. Y.

The extension, like the other buildings, will have iron stairways, and will be as nearly fireproof as possible. It will be divided by brick partition walls, 12 inches thick, with double doors, so that in the event of fire the flames can be kept from spreading. The brick walls are to be 20 inches thick; there will be 20-inch iron girders resting on 12-inch columns on the first story, and 11 and 10 inch columns on the two floors above. The girders will support 15-inch I beams, eight feet apart, and between these I beams brick arches will be turned. The roof will be formed by turning a brick arch similar to those supporting the floors, and will be filled at the top of the beams with concrete, and covered with tarred paper and gravel. The water will be carried down through the columns.

The Meneely Bearing Company, manufacturers of tubular roller journal bearings for railway cars, have issued a neat catalogue descriptive of their bearings.

In speaking of the utility of roller bearings generally, the manufacturers say:

"The failure of roller bearings to withstand heavy railway service has hitherto been due to three radical defects: (1) The existence of sliding friction; (2) faulty provision for preventing the rollers coming in contact with each other, and (3) inability to withstand the tendency exerted by the load to spread the rollers apart. These defects are obviated in the Meneely bearing by making the rollers in sectional lengths and tubular in form, thus enabling them to be firmly interlocked by interior rolling rods and held in proper relative position. The effect of the load upon this arrangement is to cause the rods and rollers to be always in rolling contact, and thereby maintaining their alignment with the journal." The offices of the company are at West Troy, N. Y.

The Portland Co., of Portland, Me., having remodeled their shops and put in new tools, are now prepared to build locomotives for any kind of service. They are at work on five locomotives, 17 by 24 cylinders and 53-inch boilers, and have just finished and delivered to the Bridgeton & Saco R. R. one narrow gauge locomotive. They are also prepared to build any kind of freight cars. They are very busy with marine engines, having contract to equip all the boats of the Boston & St. John line of steamers with engines with cylinders 64 inches in diameter.

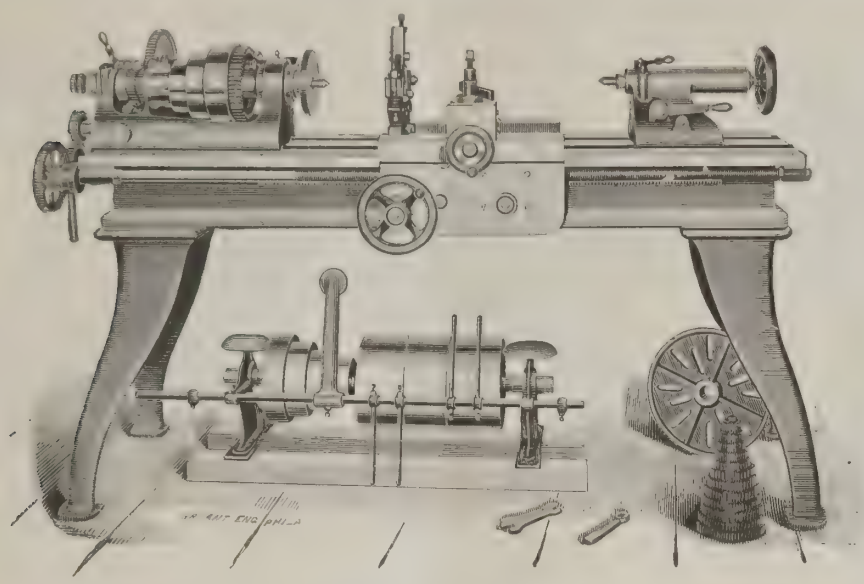
Notwithstanding the depression in the tool steel trade, the New England agency of Messrs. Howe, Brown & Co., of Pittsburgh, Pa., although their territory is somewhat limited, report that the demand for their special high grade steel is greater than it ever was before; that orders were received during the first two weeks of the month of April for 17,000 pounds more than for the whole of April, 1891.

Although the sand feeding appliance made by H. S. Leach, of Boston, has only been in use a short time, quite a number of railroad companies are using it. The Old Colony, Boston & Albany and New York, Providence & Boston roads have ordered since October last an average of ten sets per month each. The International & Great Northern have 80 sets in use. This appliance is specially needed on that road, as the dew is very heavy in Texas.

A New 14-Inch Lathe.

The accompanying illustration shows a new 14-inch engine lathe recently brought out by A. Falkenau, of Philadelphia, and which we illustrate herewith.

This lathe, while not differing greatly from the form well established by long experience, is distinguished by the neatness of its design, and the careful and well studied proportioning and arranging of its parts. A marked departure from the general practice is in the construction of the bearings for the live spindle.



While it has generally been supposed that brass or composition boxes are the proper thing for lathe spindle bearings, this is not borne out by the results of experiments and observations of some of the most prominent tool builders. Of a number of lathes running side by side in the same shop and under the same conditions, having respectively babbitt and brass spindle bearings, the spindles of those with brass bearings often get out of line sooner than those with babbitt metal. As a result of these experiences the builder of this lathe makes the spindle bearings out of a babbitt metal casting, bored and turned true.

Another valuable feature of the bearings as here constructed is the ease with which wear, when it does occur, can be taken up. The babbitt bearing is conical on the outside, fitting in a conical hole through the frame of the live head. The bearing has three saw cuts, one of them extending through to the bore to permit it to close in, as it is drawn up, which affords a very ready means of adjustment. The saw cut which goes all the way through is placed toward the top, and pieces of leather are loosely clamped in it at the ends an oil pocket is thereby formed, which enables an excellent lubrication of the bearing to be kept up.

The spindle itself at the bearings is cylindrical and the end thrust is taken on an annular step at its back end. It has $\frac{11}{16}$-inch hole through it and is made of steel. The face plate is held true by the cylindrical portion and the shoulder against which it fits, the thread serving merely to hold it on and not to center it. The size of the front bearing is two inches diameter by four inches long and of the back bearing $1\frac{7}{16}$ inches diameter by $3\frac{5}{8}$ inches long.

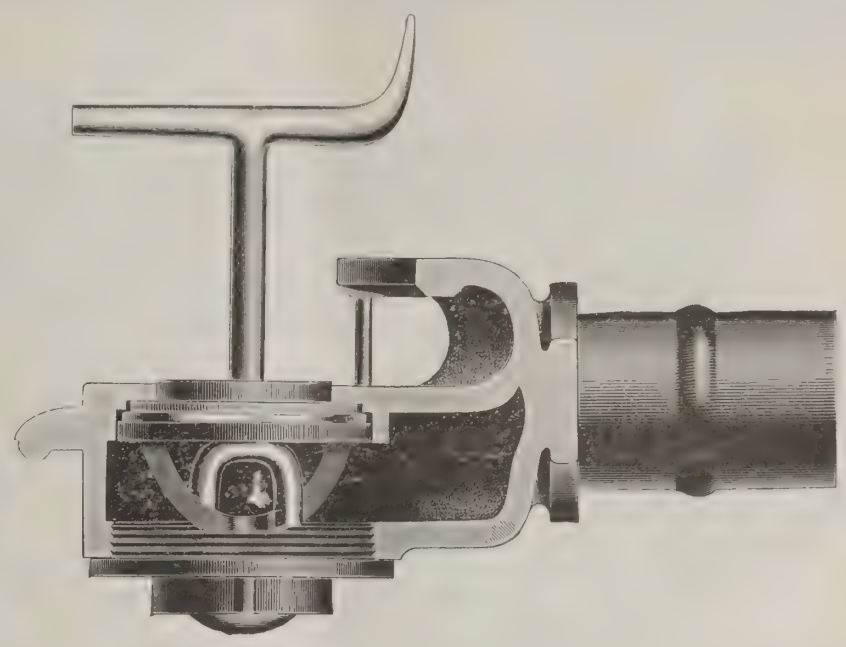
The feed gearing and rack on the shear are unusually heavy and this, in connection with the stiffness of the shear and heads, makes it possible to take cuts heavier than customary on a lathe of this size. The screw is used for screw cutting only, being splined, and acts as a feed rod for driving the ordinary feed. It cuts threads from 2 to 32 to the inch. The poppet head is easily shifted along the shear, being clamped or unclamped by a slight movement of the lever shown on the front of the head in the engraving. This lever operates an eccentric which engages with the holding-down bolt, thus making a very convenient device for securing the poppet head.

The lathe swings $9\frac{1}{2}$ inches over the carriage and with a six foot bed takes in 3 feet 2 inches between centers. The lathe will be fitted with taper attachment and compound rest if so desired. Its weight with a six foot bed, is 1,200 pounds.

The builders address is A. Falkenau, Eleventh Street and Ridge Avenue, Philadelphia, Pa.

Crane Airbrake Hose Coupling.

The following illustration gives a sectional view of the new Crane air brake hose coupling. The illustration shows the coupling with wrench inserted ready for removal of packing ring. This is accomplished by unscrewing the washer, thereby making a space through which the packing ring can be removed by the fingers and a new one inserted.



It is not necessary to remove the cap to replace the packing ring, as it can be changed in a few moments from the face of the coupling. The packing ring is renewed without removing the hose from the car, and when necessary can be replaced in two or three minutes, thereby avoiding serious trouble and delays. The wrenches for removing the packing ring are made of malleable iron. Sample couplings will be sent on application to the Crane Company, Chicago.

D. M. Dunbar, formerly with Messrs. Lowe Bros., of Dayton, O., who is well and favorably known to buyers of paint, and who has had considerable experience in selling to railway officials, car builders, etc., has made arrangements to take charge of the railway department of Messrs. Harrison Bros. & Co., of Philadelphia, Pa., manufacturers of white lead, paints, etc. This firm was founded in 1793 by John Harrison, and is the oldest as well as one of the largest paint manufacturers in the country. The area of their works at Gray's Ferry, Pa., exceeds 30 acres, their white lead plant alone producing over 5,000 tons annually.

The United States Car Company has been incorporated in New Jersey. Its principle office will be in Jersey City. The capital stock of the company is $3.500,000. Its objects are to manufacture railroad rolling stock and to own timber lands and operate saw mills.

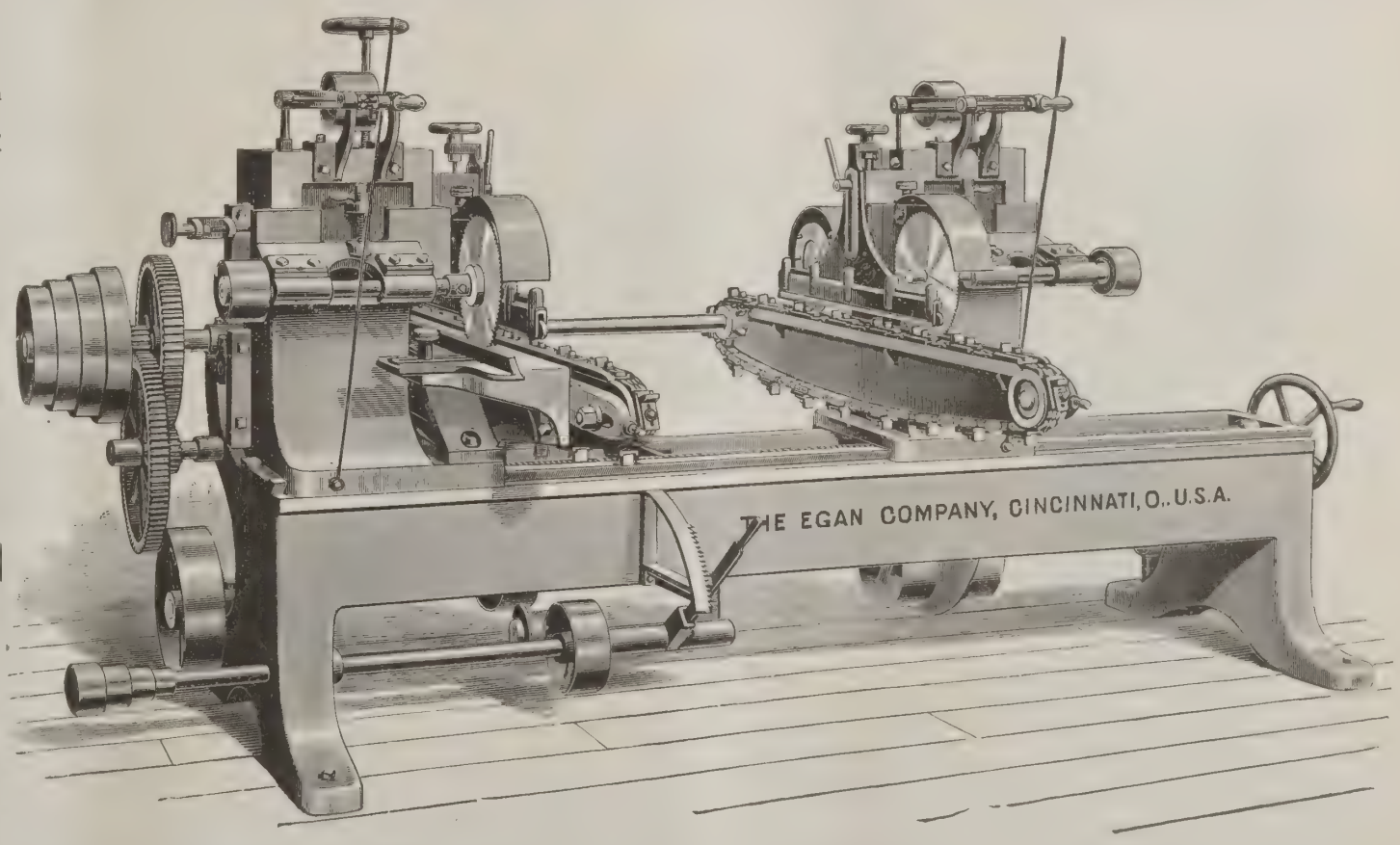
Improved Double Tenoning Machine.

This cut represents a new double tenoning machine, with automatic feed and double cut-off attachment. It is one of the greatest labor-saving machines ever put into a wood-working factory. It can do more and better work than can be done on three single tenoners. It is simple to operate, not liable to get out of order, requires no expert to run it, and any man or boy with ordinary intelligence can operate it to advantage and with profit to the owner.

The frame is one entire casting, heavily braced and planed perfectly true and with ample floor space to insure steady running. The two housings rest upon the bed, one being stationary and the other adjustable, to suit the length of stock to be tenoned, and are operated by a hand-wheel and screw at the end of the bed. The mandrels are of the best cast steel, running in self-oiling boxes, lined with babbitt metal, with the pulleys placed between boxes. Each mandrel and slide has a separate adjustment up and down on the housings to suit the thickness of tenon. The upper mandrels have also a side adjustment to allow a tenon to be cut longer on one side if necessary. The cut-off saw mandrels are placed in advance of the cutter heads, and adjustable in every way independent of each other, and driven from the countershaft below.

The feed is perfectly automatic in its operation, driven from the countershaft under the bed, and controlled by a lever handy to the operator. Suitable provision is made for changing the angle of the cut and length of tenon. The stock is held in position by adjustable pressure bars, holding each piece perfectly rigid while being cut, even if one piece is thicker than the other. There are four changes of feed to the machine to suit the work.

This machine will be found suitable for work in car shops, and, in fact, wherever tenoning is done.



The T. and L. Pulleys are 14 inches × $5\frac{1}{2}$ inches, and should run 800 revolutions per minute.

For further information address the builders, The Egan Company, Cincinnati, O.

Messrs. More, Jones & Co., representatives of R. Mushet's steels have opened a branch office at the St. Louis Railway Exchange, Southern Hotel, for the convenience of their patrons. Major O. M. Edgerly is in charge of the new office.

The Fitchburg Railroad again leads in furnishing additional accommodations to the traveling public. Recognizing the necessity of providing sleeping cars for persons holding second-class tickets it has inaugurated a Pullman tourist sleeping car service over its Erie & Boston line. The cars will leave Boston every Tuesday and Thursday at 3 P. M., and be run through to Chicago without change via Troy, Albany, Binghamton, Hornellsville, Lake Chautauqua and Marion. They are fitted up with all the modern improvements, airy and well ventilated, and provided with the necessary articles for the toilet. The price for a double berth Boston to Chicago is only $1.50. Certainly this is an improvement, and holders of second-class tickets can now enjoy a comfortable night's rest, which has heretofore been the exclusive privilege of those holding first-class tickets.

The Huyett & Smith Mfg. Co., of Detroit, Mich., ventilating engineers and manufacturers of ventilating heaters for buildings, railroad shops, etc., have just issued a new catalogue descriptive of their system and apparatus, which is in use in many of the largest buildings in the country, and the shops of the Wrought Iron Bridge Co., Canton, O., and those of the Chicago & G rand Trunk and Pennsylvania railroads. Their heaters are made of steel or wrought iron pipe, and all the headers, return bends, nipples and fittings throughout are extra heavy and made of the best possible mate ia and design for the requirements. They make their heaters in one, two, three or four sections as may be desired, for using either live or exhaust steam separately or combined, and every heater is tested in the factory after completion to 200 pounds hydraulic pressure. By their manner of piping their system can be applied to buildings already erected as efficiently as to new buildings, though in the latter they prefer building the ducts in the walls. Their heater coils are arranged horizontally, in such a manner that the breaking o straining of pipe, headers or fittings by expansion or con traction is entirely overcome and still the heater is self draining, and is less liable to freeze up in extreme cold weather than any other form of construction, and all the steam that enters the heater must pass through the heater pipes before reaching the drip or waste pipe; thus no steam or heat is wasted.

A sand feed apparatus for locomotives is being manufactured by H. L. Leach, 237 Franklin Street, Boston. It is designed to feed a small quantity of sand in a regular and reliable manner upon the rails in front of the driving wheels of locomotives, when necessary to prevent them from slipping, and to avoid the expense of hauling the trains over large quantities of sand left on the rails when it is fed in the usual way directly from the sandbox. As only a small quantity of sand is required to prevent this slipping, if fed properly, the saving in sand thus effected is considerable, and on some roads, where good sand is hard to get, highly desirable, and the more sand that is used the faster the rails, ties and wheels of the train are worn out.

The main feature of the apparatus consists of a sand trap having two chambers separated by a partition wall. Sand flows freely from the sandbox into one chamber of the trap in which is located an air nozzle, by means of which it is blown over the partition into the other chamber in such quantities as may be required to prevent slipping, and from which it passes to the rails through the usual delivery pipes. The sand flows to the traps through independent passages provided for the purpose, and therefore in no way interferes with the profuse sanding of the rails in the usual manner whenever necessary to assist the brakes in making emergency stops.

The compressed air used is taken from the pipe leading from the main reservoir to the engineer's brake valve, and passes to the air nozzles through a single line of quarter-inch piping, the supply being regulated by a feed valve of the proper construction placed in the cab convenient to the engineer. A pressure of from one to five pounds through a nozzle one thirty-second of an inch in diameter will provide all the sand required.

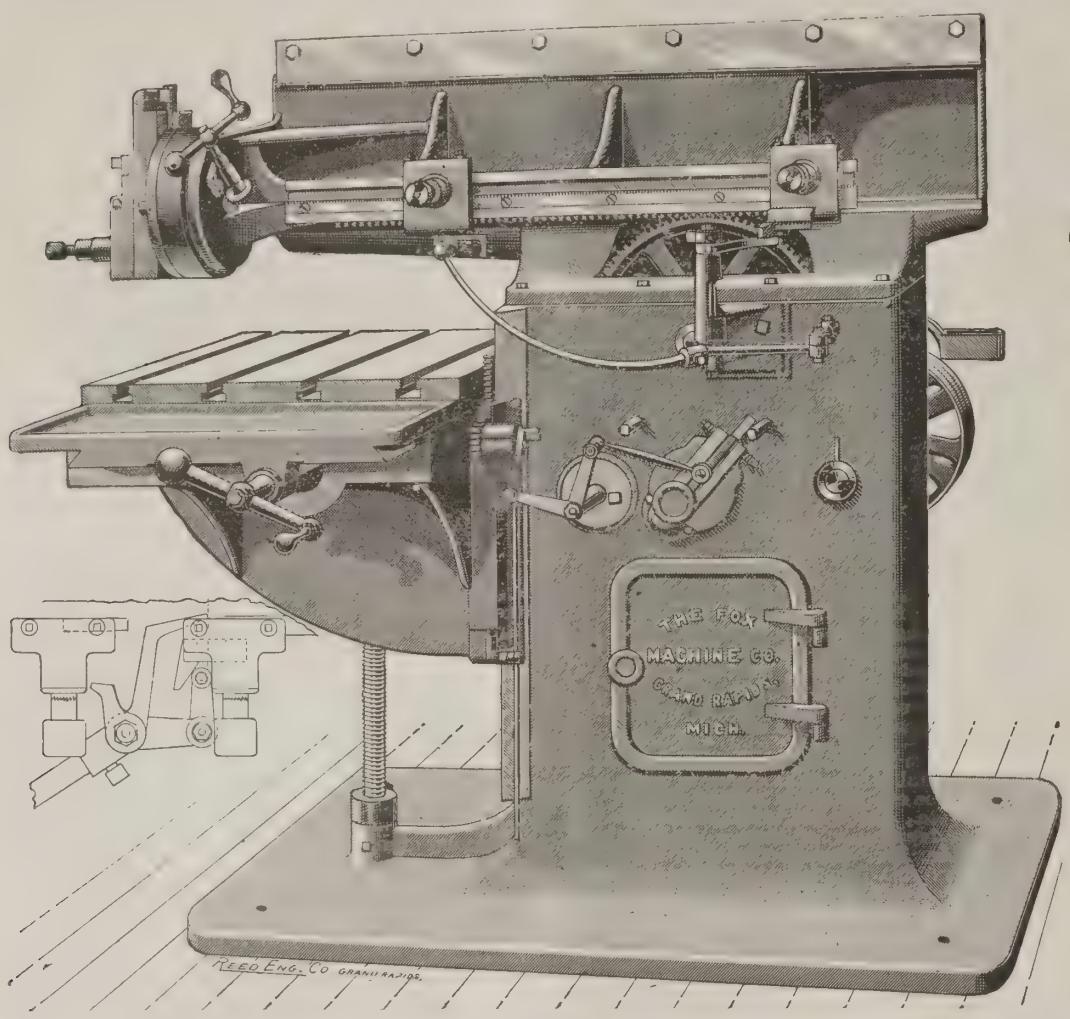
A trial set of these feeders will be furnished free by the manufacturer on application.

Fox Open Side Shaper.

We present herewith an illustration of an open side shaper manufactured by the Fox Machine Company, of Grand Rapids, Mich.

The distinguishing features of this new machine is that it is an entirely new departure in the line of shapers. It is a tool which will do accurate work the full length of the stroke, as the springing of the ram is overcome by extending the housing out over the table, which thoroughly supports it in all parts of the stroke.

The shifting device on the ram is in advance of anything



heretofore used. There is a rack let into the side of the ram, into which engages the pinion that is carried in the sliding block. By withdrawing the handle, which has a ratchet tooth upon it, the pinion can be disengaged from the rack and the block slid to any position on the ram. Upon releasing the handle the gears return into mesh with the rack, and the ratchet teeth lock it securely, so that it cannot be moved by the dog pushing against the finger.

If it is desired to move the sliding block with its dog a short distance, the handle is withdrawn about $\frac{1}{16}$ inch, sufficient to disengage the ratchet tooth, when the gear can be rolled in either direction, moving the slide any definite part of an inch, one ratchet tooth making a distance of $\frac{1}{16}$ inch in the length of the stroke.

The dogs attached to the slide, also the fingers on the shifting bar are all of forged tool steel, and tempered where they come into contact with each other.

The bottom guideway is a V at an angle of 45 degrees, having two inch bearing at each side. The oil pocket, with a pair of brass rollers, always keeps the V thoroughly lubricated. There is a gib at the top by which all wear can be taken up.

Another important change made in the construction of this tool is the substitution of a knee for the apron and square table usually found on a shaper. With this method of construction a much larger platen is used, at the same time not having any overhanging weight as is the case with a square table. This feature will be appreciated by anyone who has had occasion to use a shaper, from the fact that a surface is secured 24 inches square which is planed and suitable for fastening work to, instead of a 7 × 9 inch table as is usually the case with machines of this size.

A good friction counter-shaft is furnished with each machine giving a speed of 19 feet per minute for wrought iron and steel, and 24 feet per minute for cast iron and brass with a return of the ram of three to one.

on short work from any position, thus making it suitable for bolt work also.

The "National" head on this machine is so well known to our readers as to require no explanation, and the cut fully illustrates the points above mentioned.

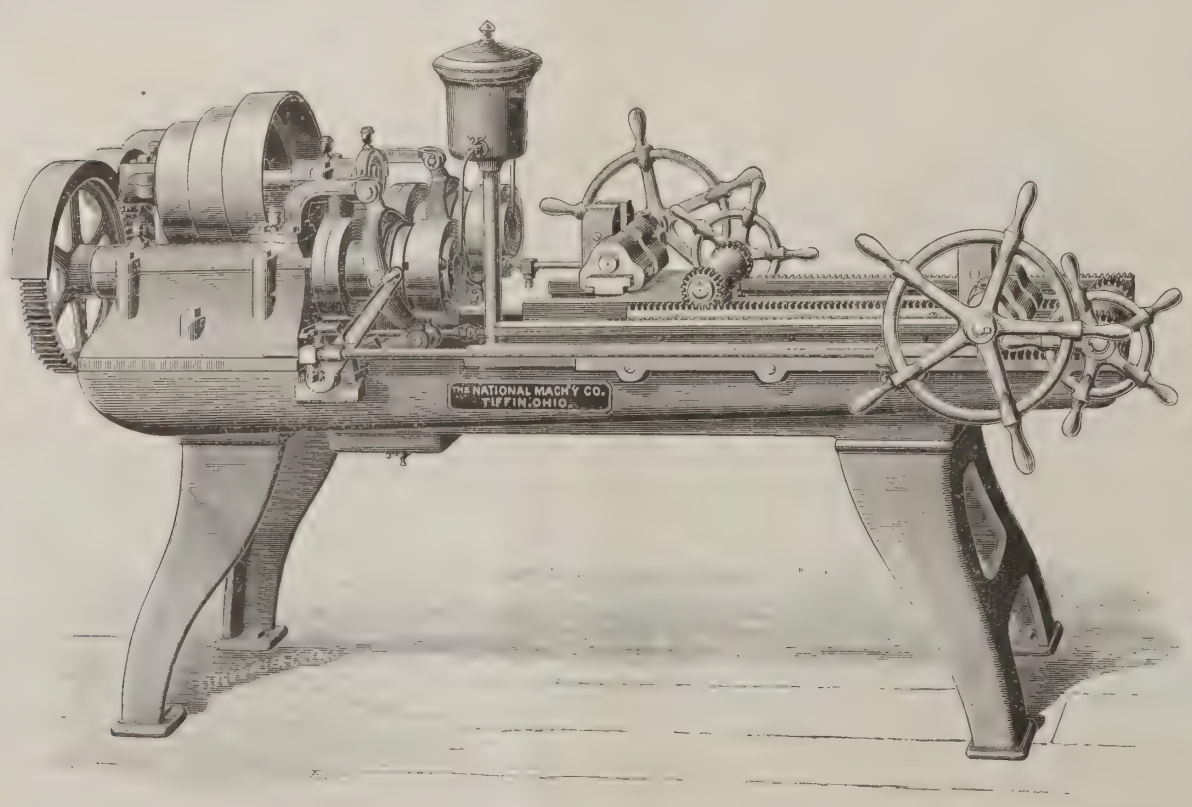
The National Machinery Company, Tiffin, O., makers of this tool, furnish also when desired a nicker attachment to mark in advance the different lengths the three-foot bar may be wanted cut into when finished.

The dies open automatically at any desired point. When preferred, the machine is furnished with a single head in stead of double as shown.

Staybolt Threading Machine.

The importance of exact and close-fitting threads on staybolts is being daily more clearly recognized in locomotive and boiler shops, and in consequence the solid die is, in many cases, being abandoned for the adjustable opening die, which does not spoil the thread backing off, is speedier and can be adjusted to make a tight fit to any size tap, following its wear if necessary.

Our illustration shows one of the latest designed tools adapted to cut staybolts three feet or under at one setting, and yet so compact that the operator can handle the vices



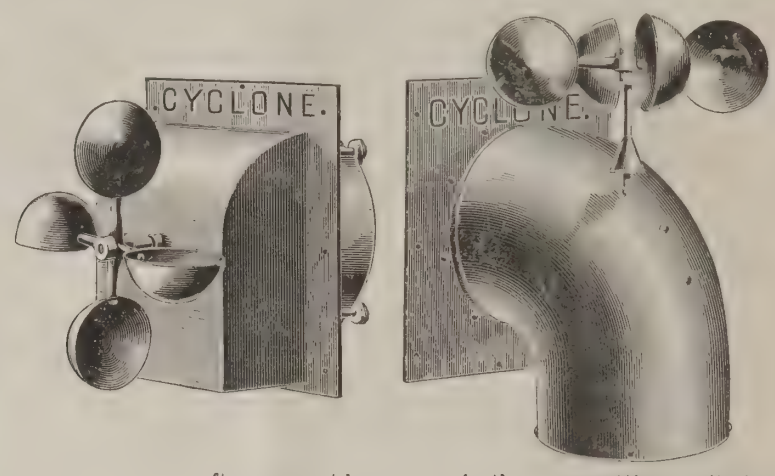
The Cyclone Ventilators.

On this page will be found illustrations of the two styles of car ventilators just brought out and placed on the market by M. C. Hammett, of Troy, N. Y., the manufacturer of the well known and favored Richardson and Allen-Richardson slide valves.

It is called the "Cyclone," and is the invention and design of W. S. Rogers, who has made quite a study of the subject of railway car ventilation, as the simplicity and practical workings of the Cyclone attests. Mr. Rogers is superintendent of M. C. Hammett's works, and is well known among the railway master mechanics throughout the country. The name "Cyclone" was the suggestion of Superintendent of Motive Power Blackall, of the Delaware & Hudson Canal Company, when he first saw it, and the name was at once adopted.

Smoking car No. 53 on the above road is equipped with them and is proving a great success. Ten Cyclones have been put on in place of 26 ventilators of the ordinary type, and the atmosphere is always clear and foul nicotine gases quickly drawn out through the deck.

They are placed on the sides of the deck in the same manner as the ones now in common use. On coaches having the movable deck sash and wire screen guards, the ventilators are placed just outside the screen, eight of them being sufficient to thoroughly ventilate and purify the atmosphere within. The cup-shaped balls on the outside of the case are actuated by the currents caused by the motion of the train, or the usual air currents operate the wings of an exhaust fan inside that forces the air within the car out, and at the same time prevents cold air from blowing in the deck through the ventilators. Their construction is such that the slightest breeze puts them to work. No skill is required to put them on or operate them, and there is no care required



after once put in use, nor is there any cutting or altering of the present deck arrangement necessary for their application. The simplicity and ease of application, together with the substantial results produced by the cyclone, bespeak for it a very favorable reception by the railroad passenger and mechanical departments who are daily looking for new and desirable features that will add to the comfort of the traveling public.

The enterprising Lunkenheimer Brass Manufacturing Company, of Cincinnati, O., are preparing for the World's Fair a most elaborate display of their popular specialties in valves, sight feed lubricators, oil and grease cups, etc. They will also exhibit a complete line of brass and iron goods, besides some novelties in steam whistles and sight feed lubricators. They report business exceedingly brisk, being crowded with orders for their numerous specialties and receiving large contracts for special work for United States cruisers.

The Empire car coupler has been developed by practical railway men, and, as perfected, demonstrates a high efficiency of the M. C. B. type. It fully meets all the requirements of actual service as a workable device, and as an automatic safety device provides for every demand contemplated by Master Car Builders, law makers and humanitarians. The element of first consideration in a car coupler is *strength*, and the same principle that the weakest point in a bridge represents its maximum strength is applicable in any car coupler. Extraordinary strength is secured in the Empire coupler by providing from 5 to 6 square inches of locking surface, and by the knuckle engaging with the side and end of the draw head in such a manner as to almost entirely relieve the pin from either buffing or pulling strains. Under this construction a small pin is used, allowing for more material in the knuckle and the jaws of the drawhead. The drawbars will be manufactured from the best quality of malleable iron, and the knuckles from a grade of steel which has earned a high reputation in such work. Full size couplers set up in working order can be seen at the office of the company, 15 Warren street, New York City.

Our Directory.

Baltimore & Ohio.—L. J. Buckley has been appointed Purchasing Agent.

Baltimore & Ohio Southwestern.—E. Evans has resigned as Master Mechanic of the Shops at Chillicothe, O.

Central of Georgia.—M. Conner has been elected President, vice E. P. Alexander, resigned.

Central of New Jersey.—A. Foster has been appointed General Purchasing Agent.

Chicago, Rock Island & Pacific.—J. Givin, Superintendent of the Iowa Division, died at Des Moines, Ia., March 24, 1892. S. B. Hovey has been appointed Superintendent of the southwestern division, with headquarters at Herrington, Kan., vice C. H. Hubbell, transferred to the western division, with headquarters at Colorado Springs, Colo.

Chicago, St. Paul & Kansas City.—C. Shields, General Superintendent, has resigned.

Columbus Southern.—C. Gabbett has been appointed General Manager, vice W. T. Shellman, who has been appointed Traffic Manager of the Central of Georgia.

The Concord & Montreal.—E. F. Mann has been appointed Superintendent; office at Concord, N. H.

Duluth & Iron Range.—Thomas Owens has been appointed Superintendent of this road, with office at Two Harbors, Minn. A. M. Smith has been appointed Assistant Superintendent of this road, with office at Two Harbors, Minn.

Grand Rapids & Indiana.—James Kegan has been appointed Master Mechanic of the road to succeed L. T. Bradley, deceased.

Great Northern.—C. Shields has been appointed Superintendent of the Western Division.

Illinois Central.—H. McCourt has been appointed Superintendent of the Amboy Division, vice J. C. Jacobs, resigned.

Louisville, Evansville & St. Louis.—J. A. S. Montgomery has been appointed Superintendent.

Louisville, New Orleans & Texas.—W. J. McKee has been appointed Superintendent.

New York, Lake Erie & Western.—E. A. Mitchell, formerly mechanical engineer, has been appointed Superintendent of Motive Power, succeeding the late R. Kells.

New York & New England.—Mr. C. S. Mellen has been appointed General Manager.

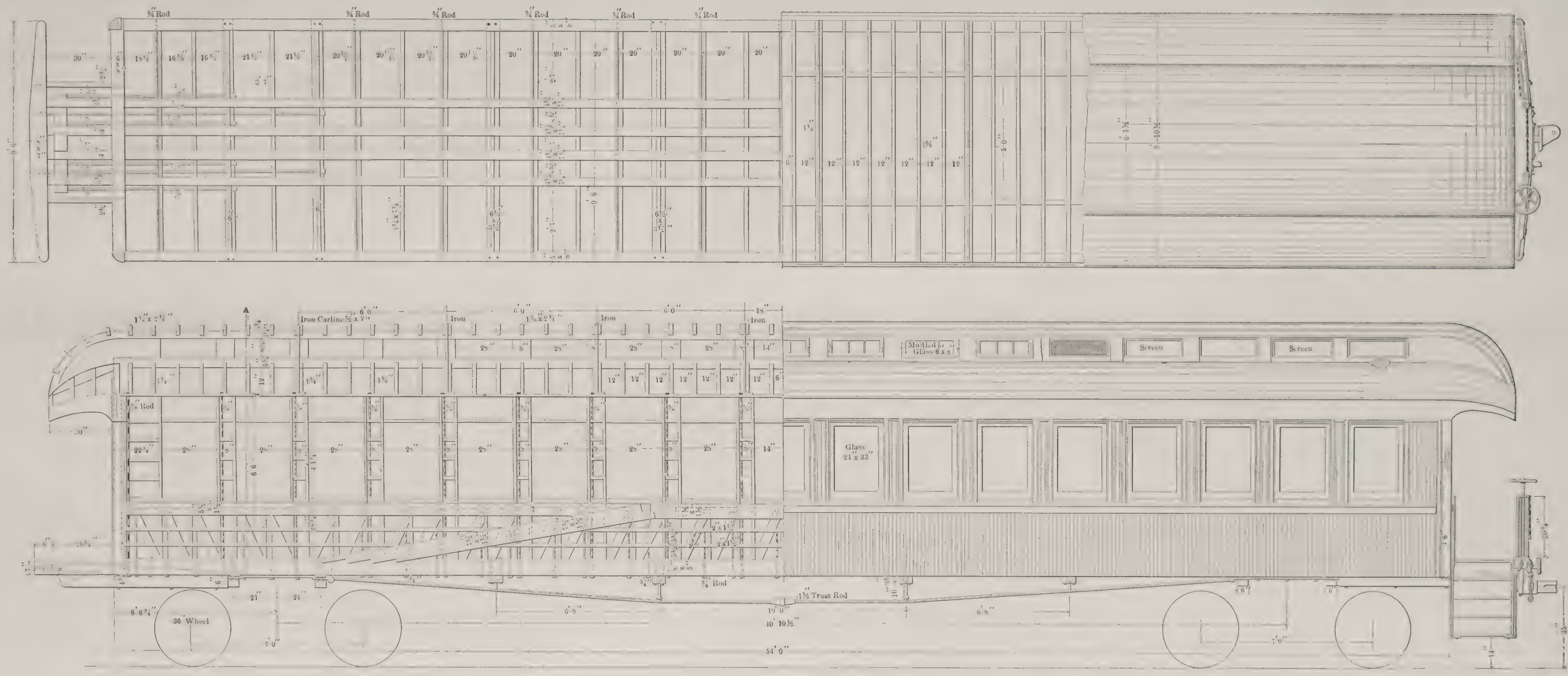
Ohio River.—G. C. Gardner has been appointed General Manager. C. L. Williams has been appointed Superintendent; offices at Parkersburg, W. Va.

Seattle, Lake Shore & Eastern.—I. A. Nadian has been appointed Superintendent of Western division, with office at Seattle, Wash. F. W. Gilbert is appointed Superintendent of the Spokane division, with headquarters at Sprague, Wash.

Southern Pacific.—A. D. Kilborn has been appointed Master Mechanic of the Shasta division; headquarters at Dunsmuir, Cal.

Union Pacific.—A. C. Hinckley, Master Mechanic of shops at Salt Lake City, Utah, has resigned.

Zanesville & Ohio River.—G. C. Gardner, Superintendent, has tendered his resignation to take effect May 1, to become General Manager of the Ohio River.



STANDARD PASSENGER CAR,

New York Central & Hudson River Railroad.

NATIONAL CAR AND LOCOMOTIVE BUILDER

JUNE, 1892

CONTENTS.

The Pennsylvania proposes to add 7,000 new freight cars to its equipment during the year.

The Duluth & Iron Range has received 10 consolidation locomotives from the Schenectady Locomotive Works.

The Minneapolis, St. Paul & Sault Ste. Marie has placed an order for 500 50,000-pound box cars with the Wells-French Car Company.

A large freight house and storeroom of the Philadelphia & Reading was burned at Philadelphia on the night of May 7. Loss about $80,000.

On the morning of May 6, the shops of the Northern Car Company, near Minneapolis, were burned, together with a large number of cars.

The Louisville & Nashville depot and hotel at Paris, Tenn., was burned on May 2. Much freight and many valuable records were destroyed.

William Mable, a mechanic employed in one of the shops at Fort Collins, Colo., has patented an automatic device for coupling cars and airbrakes at the same time.

A jury has given to John F. Reese, a traveling man, a verdict of $25,000 damages against the Union Pacific Railway for injuries resulting in the amputation of one arm.

The United States Rolling Stock Company has been reorganized under the laws of New Jersey as the United States Car Company. The capital stock of the new corporation is $3,500,000.

The gross earnings of the Canadian Pacific for the year ended on Dec. 31, 1891, were $20,241,095; working expenses, $12,231,436; net earnings, $8,009,659. The working expenses for the year amounted to 60.43 per cent. of the gross earnings.

The Florida Midland has been doing a splendid business for the past year and the track and rolling stock are to be greatly improved. New shops are to be erected at Kissimmee, also a new roundhouse. Two new turntables will be put in at once.

The Pullman Palace Car Company is building 12 parlor cars for the Southern Pacific. The cars will be different from those at present in use on the Southern Pacific, as they will have two drawing rooms instead of one, and will be several feet longer.

The engineer of one of the Chicago cable roads recently said that the power required for the operation of the system was fully 20 per cent. less on rainy days when the rails were kept wet, while there was a large increase of passengers carried at such times.

It is reported that the excessive competition among the manufacturers of locomotive tires that has existed for the last few years will soon be brought to an end by an arrangement that will harmonize the conflicting interests and secure more remunerative prices.

The Pittsburgh Locomotive Works have begun the erection of a new machine shop at their works at Allegheny. It will be of brick, with iron framework, and will be 365 × 125 feet. They are also building a blacksmith shop 365 × 100 feet, with an 80-foot wing, which will also be used for a hammer shop.

The Chicago, Burlington & Quincy Railroad Company continues to pile up big earnings. Its statement for the month of March, 1892, shows another net increase of $261,877, and since Jan. 1, 1892, it has made a net increase of $1,032,455, as against a deficit of $261,748 for the corresponding period last year.

The annual report of the Michigan Central makes the following showing: Gross earnings, $15,162,960, an increase of $672,219 as compared with last year; expenses and taxes, $11,107,369, an increase of $375,015; net earnings, $4,055,300, an increase of $299,428; balance after dividends, etc., taken out, $197,355.

An attempt was made to wreck the Chicago Limited Express on the Illinois Central Railroad, near Holly Springs, Miss., on the night of May 1. While the track was being cleared of the obstructions, which had been seen in time to avert a disaster, a freight train crashed into the rear of the passenger train and wrecked several cars.

Prof. Charles D. Walcott, of the United States Geological Survey, intends to have at the World's Fair an exhibit which will illustrate a section of the earth's crust by specimens of the rock strata placed in their proper relative positions, and by collections of the characteristic fossils shown in connection with the formations in which they are found.

Beginning May 15 the Michigan Central put on a new train between Chicago and Buffalo, to do the business eastbound destined to Niagara Falls and Thousand Islands. It leaves Chicago at 5 P. M., reaching Buffalo early the next morning. All the through trains on the Michigan Central are soon to be supplied with entirely new equipments.

Recently, while repairing a passenger car in the shops at Altoona, the workmen found 16 $500 bonds sticking in the water closet ventilator. They were drawn in favor of Smith County, Tenn., by the Tennessee & Nashville Railroad. Later, in the same car, 24 $250 bonds of the same kind were found. It is supposed they were hidden by a hard-pressed thief.

The Western Electric Dummy Company has secured the contract for operating a passenger railroad in the World's Fair grounds. The proposed road will be a double-track elevated structure, with no grade crossings. The length of track will be about five miles, and stations will be at intervals of 1,000 feet. Trains of five or six electric cars will be run at short intervals.

The New Orleans and Carrollton street railway has just closed contracts with a view of adopting the electric system. The company will reconstruct all of its tracks and add four miles to same. Fifty new cars have been ordered of the St. Louis Car Company, and while the best of the company's old cars will be rebuilt a large additional equipment will probably be purchased.

Among the railroad exhibits at the World's Fair will be an engine named "Lord of the Isles," owned by the Great Western Railway of England. This engine was built in 1851 at the company's works at Swindon, and was on exhibition at the first World's Fair in London. She ran steadily from the time she was built until 1881, and covered 789,300 miles without having her boiler replaced.

A serious wreck between a freight and passenger train occurred on the "Big Four" road May 15, in which eight people were killed and a number injured. It is said that the accident was due to one of the engineers forgetting a change made in a new time card taking effect that day. Both engineers and firemen are reported killed and both locomotives and several cars demolished.

The boiler of a Pennsylvania & Northwestern locomotive exploded in the yard at Irvona, Pa., on the morning of May 4. The engineer and fireman were instantly killed. It is reported that the fireman's body was blown through a box car and the engineer's body was found 100 yards away. Pieces of iron weighing from two to five hundred pounds were sent flying through the air, some as far as a quarter of a mile, but doing no serious injury.

The German Emperor is at last in possession of the luxurious imperial train which has taken three years to complete. It cost about $400,000 and consists of twelve carriages communicating by corridors, a drawing-room and a library, hung with gobelins from Charlottenberg Palace, and a dining-room paneled in old oak. Two compartments are reserved for a nursery. A bath is attached to each sleeping room, and the reception-room is decorated with marble statuary. One car consists of a kitchen fitted with every modern appliance.

One of the most disastrous fires that has ever occurred in New Jersey was started by a spark from a locomotive near Richland recently, and burned over a thousand acres of the finest standing timber in South Jersey. Forces of woodmen and citizens of Richland labored hard to keep the fire from a large and valuable cedar swamp of several hundred acres, but a strong wind carried the flames rapidly along, and in a few hours a large amount of the finest cedars was burned.

A large electric locomotive is now being built at the works of Brown, Boveri & Co., at Baden, Switzerland. This engine will be fitted with dynamos of a total of 1,500 horse power, but which can be increased to 2,000 horse power. The power will be transmitted to eight electromotors, arranged on the same number of axles. It is expected by the builders that this locomotive will attain a higher speed than is usual with steam locomotives. Trials of its capacity are to be made next fall.

The annual report of the Lake Shore & Michigan Southern shows that the earnings for 1891 were the largest since the organization of the company, being $21,431,386 as compared with $20,865,760 in 1890. The operating expenses for 1891 were $14,632,675, including $1,019,367 for permanent improvements. The net earnings for the year were $5,795,711. From this is deducted the interest on the funded debt, rentals and 10 per cent. dividend on guaranteed stock, leaving a surplus of $3,439,460, or $6.95 per share.

The annual convention of the Brotherhood of Locomotive Engineers was held at Atlanta, Ga., beginning May 11. It is reported that a resolution was adopted approving of the Sunday closing of the World's Fair. P. M. Arthur was re-elected Grand Chief Engineer. Mr. William P. Marks, a delegate representing the engineers at Toronto, Can., has been employed as an engineer on the Grand Trunk for 30 years. Speaking of mileage Mr. Marks says he has been averaging about 850 miles each week for 20 years, or 41,600 each year, and in 20 years 832,000. This would girdle the earth 33 times.

An eastbound freight train on the Pennsylvania Railroad was wrecked by a broken brake beam near Coatesville, Pa., about midnight May 1, and blocked the westbound track. A westbound train composed of mail and express cars was due at the time, and before it could be signaled ran into the wreck. The locomotive of the latter train was thrown from the track and buried in an embankment. The engineer and fireman were caught in the wreck, and the engineer was roasted to death, his body being almost unrecognizable. The fireman was badly scalded. Several express cars took fire and were consumed. The tracks were blocked for the rest of the night.

While a westbound New York Central freight train was taking water at Churchville station at 12:20 o'clock A. M. May 1, another freight train bound west came along and crashed into the caboose of the standing train. A number of cars were thrown upon the eastbound track and a minute later an eastbound train ran into the pile of wrecked cars. W. H. Fones, of Buffalo, the engineer of the eastbound train, was killed instantly, and his fireman was slightly hurt. The wreck caught fire from the oil car and the body of Engineer Fones, which was pinned down by the wreckage, was burned. Twenty-five cars, many of them loaded with merchandise, were destroyed before the wrecking and train crews got the fire under control.

Mr. H. A. Todd, Master Mechanic and Master Car Builder of the Washington Southern, at Shelton, Wash., has been granted letters patent on the following improvements to logging cars: Journal bearings engaging the upper part of the journal-box by means of lugs, which prevent the brasses turning. Center-plate for logging cars, a device which allows full play of the bunks on which the logs rest, and prevents them from turning over. A chock-block for logging cars, which fits on the bunk to support the logs, and is easily removed or shifted by hand, but is firmly locked by the weight of the logs. These improvements are being adapted to the logging cars now in use by the Washington Southern, and the company will also apply them to all trucks built in the future.

The rusting of rails in long tunnels is the subject of a recent article in the *Civil Ingenieur* describing the results of observations. The rails in one tunnel had been down for eleven years, and at the end of that time were covered to a depth of 0.16 to 0.24 inch by hard scales, which could only be removed by a knife. They were composed mainly of iron sulphide, and were found principally on the web. While the weight of the rail was much reduced in this manner, its sectional area was found to have increased, owing to the flaky character of the rust. The new rails have been covered with a mixture consisting largely of tar, which is renewed every six months. The gravel ballast has also received a partial covering of broken limestone, and by these means it is hoped that the formation of rust will be retarded. In other tunnels it was found that rails and metal ties were destroyed by rust as fast as by the passing trains. The ties lost about 5.9 pounds each in six years.

Tests to Ascertain Amount of Steam Used by Air Brake Pump.

Following we present the results of some tests made on the Southern Pacific road to ascertain with accuracy how much steam was used in running the air pump, and how much heat in consequence was thrown into the exhaust.

The object in making the tests was to ascertain about what economy would result from turning the exhaust steam from the air pump into the tank for the purpose of warming the feed water. Following is the report of the Engineer of Tests, the late A. B. Ropes :

As the Westinghouse pump is operated without any cut-off arrangement, the benefits which might accrue from expansion of the steam are lost, and the steam is exhausted into the air at the same pressure with which it is admitted into the steam cylinder.

To arrive at the amount of steam used, therefore, it was necessary to know how many strokes the pump made, and the average pressure at which the automatic regulator admitted steam to the pump. A speed counter was taken from the steamer stores, and arranged to be operated by a rod screwed into the air piston of the pump, so that every double stroke would register one on the counter.

A steam gauge inserted between the regulator and pump furnished the means for ascertaining the pressure at which steam was delivered to the latter. The average pressure of the steam in the pump cylinder did not vary over 5 pounds during the trip. When the air pressure was reduced in the drum the regulator would at once open a little, and keep up the pressure of the steam supplied to the pump; this average pressure was 85 pounds.

The first run was made on train No. 12, a local passenger, between Sacramento and Oakland. The register of double strokes made, and pounds of steam used between stations and totals are given below :

DOWN TRIP.

	Double strokes.	Lbs. steam used.
Sacramento to Davis	561	69.179
Davis to Dixon	551	67.228
Dixon to Elmira	678	82.723
Elmira to Suisun	591	72.108
Suisun to Benicia	1,358	165.689
Benicia to Oakland	2,862	349.192
Total	6,607	806.119

As the steam cylinder is 8 inch diameter by 9 inch stroke 904.68 cubic inches of steam were used in a double stroke, and taking a weight of a cubic foot of steam at 85 pounds gauge pressure, as 0.23802 pounds, the figures given above are obtained.

The total heat in 806.119 pounds of water evaporated at 85 pounds pressure would evaporate 962.506 pounds of water from and at 212 degrees.

From the comparative fuel tests lately finished we see that Nanaimo coal evaporates 7.32 pounds of water per pound of coal, so that $\frac{962.506}{7.32} = 131$ pounds of coal were used to generate the steam to run the pump on the way down.

During the fuel tests we ascertained that an average of 4,500 gallons of water, or 37,500 pounds passed through the tank during each trip on the run. The total heat in 806,119 pounds of steam between 60 degrees (temperature of feed water) and temperature of evaporation is 930,132 thermal units.

This would heat the 4,500 gallons of water 24.8 degrees if all could be utilized, or from 60 to 84.6 degrees; but fully 25 per cent. would be lost by conduction from pipes to tank, friction, etc., leaving the net result in a saving of fuel of 98.25 pounds per trip, or about 2.1 per cent. of that used.

On the return another class of train was selected, viz., the overland express, No. 1. The train was so heavy that it was divided, and engine 1,006 took the first section only. The result tallied very closely with the first trip, there being only a difference of three pounds of coal total between the amount required on the down trip and the up trip for the pump.

	Double strokes.	Lbs. steam used.
Oakland to Benicia	2,612	318.690
Benicia to Suisun	1,537	187.529
Suisun to Elmira	722	88.091
Elmira to Dixon	689	84.065
Dixon to Davis	483	58.931
Davis to Sacramento	702	85.651
Total	6,745	822.957

On the same method of calculation we find that 822.957 pounds of steam at 85 pounds pressure correspond to 982.610 pounds of water evaporated from and at 212 degrees, and this to an expenditure of 134 pounds of Nanaimo coal ; the net saving would be 2.2 per cent. of the total amount used.

A Train of Compound Locomotives.

The engraving herewith is from a photograph of a train of 21 Baldwin compound locomotives started from Philadelphia, April 25, and run through to Chicago. The train consisted of the 20 compound engines built for the "Alley" elevated road of Chicago, and was hauled by the large 10-wheel compound locomotive built for the Master Mechanics' Committee. This locomotive was returning to Chicago to continue the tests on the Chicago, Burlington & Quincy Railway, which, as mentioned in the May NATIONAL CAR AND LOCOMOTIVE BUILDER, were interrupted by a serious leak in one of the firebox side sheets.

A TRAIN OF 21 COMPOUND LOCOMOTIVES.

A description and illustration were given in our last issue of the engines for the elevated road. The engine that hauled the train has high pressure cylinders 14 × 24, and low pressure cylinders 24 × 24, driving wheels 72 inches diameter; total weight of engine in working order about 133,000 pounds; weight on driving wheels about 100,000 pounds; aggregate weight of engine and tender when in working order, about 200,000 pounds; wheel base, total, 24 feet 2 inches ; driving wheel base, 12 feet 6 inches.

The boiler is 62 inches in diameter, and has 270 2-inch flues 14 feet in length. The firebox is $120\frac{5}{16}$ inches long by $33\frac{7}{8}$ inches wide, and the grate surface is 27 square feet. The total heating surface of fire box and flues is 2,135 square feet.

The weight of this novel train, exclusive of the engine hauling it, was 1,000,000 pounds, and three relays of engineers and firemen were required, working eight hours each, to enable the train to run night and day without other stops than were necessary for coal and water. Pilot engineers were taken over each division of the lines traversed by the train. Several engineers and machinists accompanied the train, to watch and oil the engines of which it was composed.

Sleeping Cars Between Paris and Rome.

The Midland Railway Carriage and Wagon Company have just built, at their Abbey works at Shrewsbury, five sleeping cars for the International Sleeping Car Company, for their service between Paris and Rome. The carriages are 48 feet 8 inches long over the body, 54 feet 7 inches over the buffers, and 9 feet 3 inches wide outside, each carriage being supported on two four-wheeled bogies. The woodwork is of polished teak, with brass antique fittings and upholstered in figured tapestry. The interior of each coach is divided into seven compartments, in English style, with a corridor running the whole length of the carriage, connecting with a platform at each end, and communicating also with the next car by a gangway. Each car has sleeping accommodation for 18 persons and is provided with lavatories, hot and cold water and heated by hot water pipes extending the whole length of each side of the carriage, the heating apparatus being under the control of the conductor. Each compartment is furnished with an electric communication with the conductor, and is lighted by gas. The class of brake used on the cars is the Westinghouse type.—*Engineering.*

Car Roofing.

For a good many years master car builders and railroad engineers have been seeking substitutes for the ordinary wooden car roof. Metal roofs of various kinds have been tried, but those without a wood backing have mostly proved failures from the ease with which they are punctured as well as from the quickness with which the natural corrosion of the acid gases generated in burning coal in the locomotive furnaces, combined with dampness, causes leakage in spite of the ordinary paints; besides, the tendency to collect moisture from condensation has been a constant source of complaint from shippers.

The semi-metal roofs, or metal roofs with an undercourse of boards, have been but little more satisfactory from inherent reasons. They, too, become quickly punctured by the heavy nails in the boots of trainmen, who cannot be kept on the running boards, while rust follows the collection of moisture between metal and boards. Tin of a quality to resist corrosion for any considerable length of time and of heavy enough plate to stand the required wear, would be altogether too expensive. Should aluminum ever be produced at a cost such as to make its use general, its lightness might possibly allow of its being made of sufficient thickness to be used without danger of being easily punctured, which might make it the ideal car roofing.

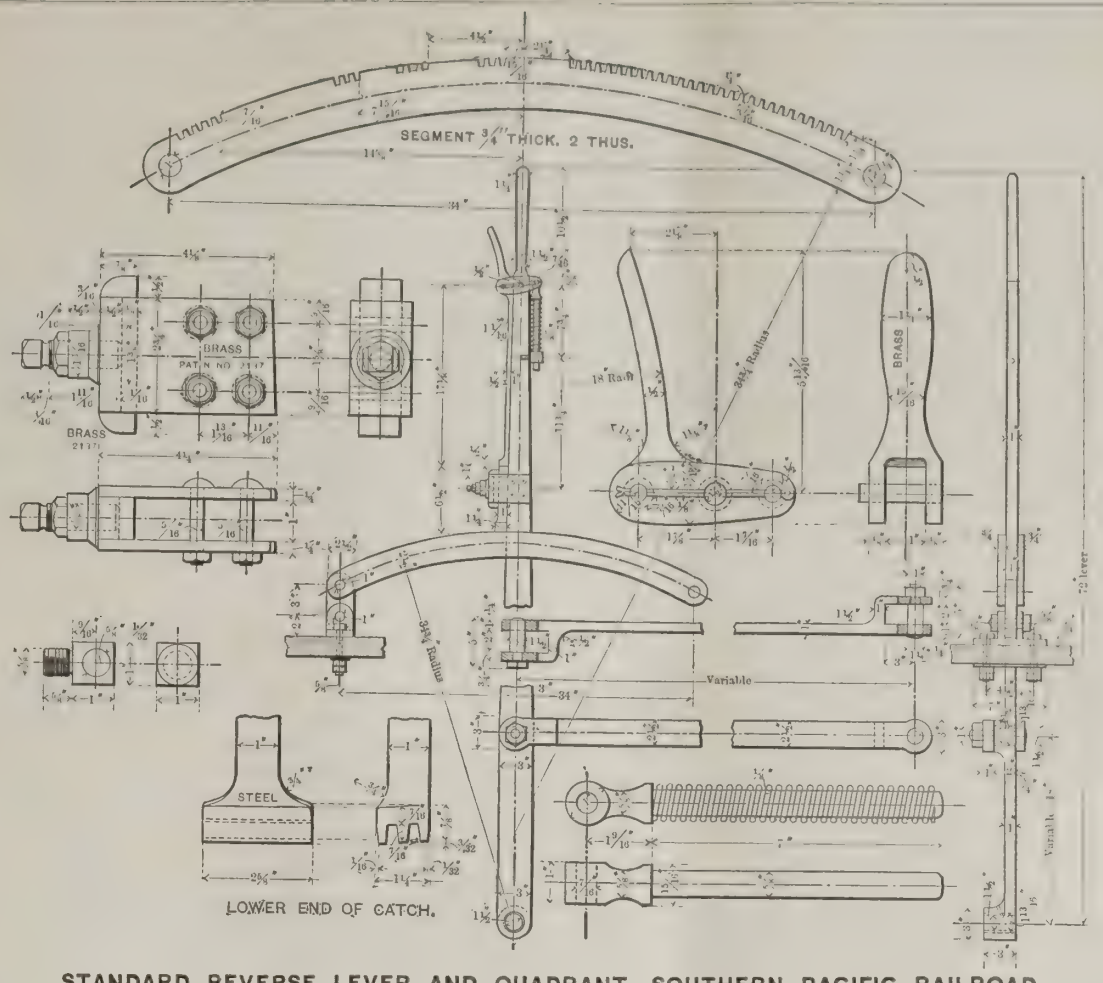
It is doubtful if any kind of material ever used has made a really more satisfactory car roof in all respects, than Indiana or Michigan poplar. Redwood has been tried with fair results, and it is understood some master mechanics of the extreme West are experimenting with yellow cedar for an under and Douglass fir for a top course. It has been suggested that cypress would make a good roof, or at least would work excellently well for an under course, with pine or some other lumber over it, though there may be no reason why both courses should not be cypress. It is a lumber that will stand wear of a hard and continuous kind, as well as the influence of the elements.—*The Northwestern Lumberman.*

Close Notched Locomotive Quadrants.

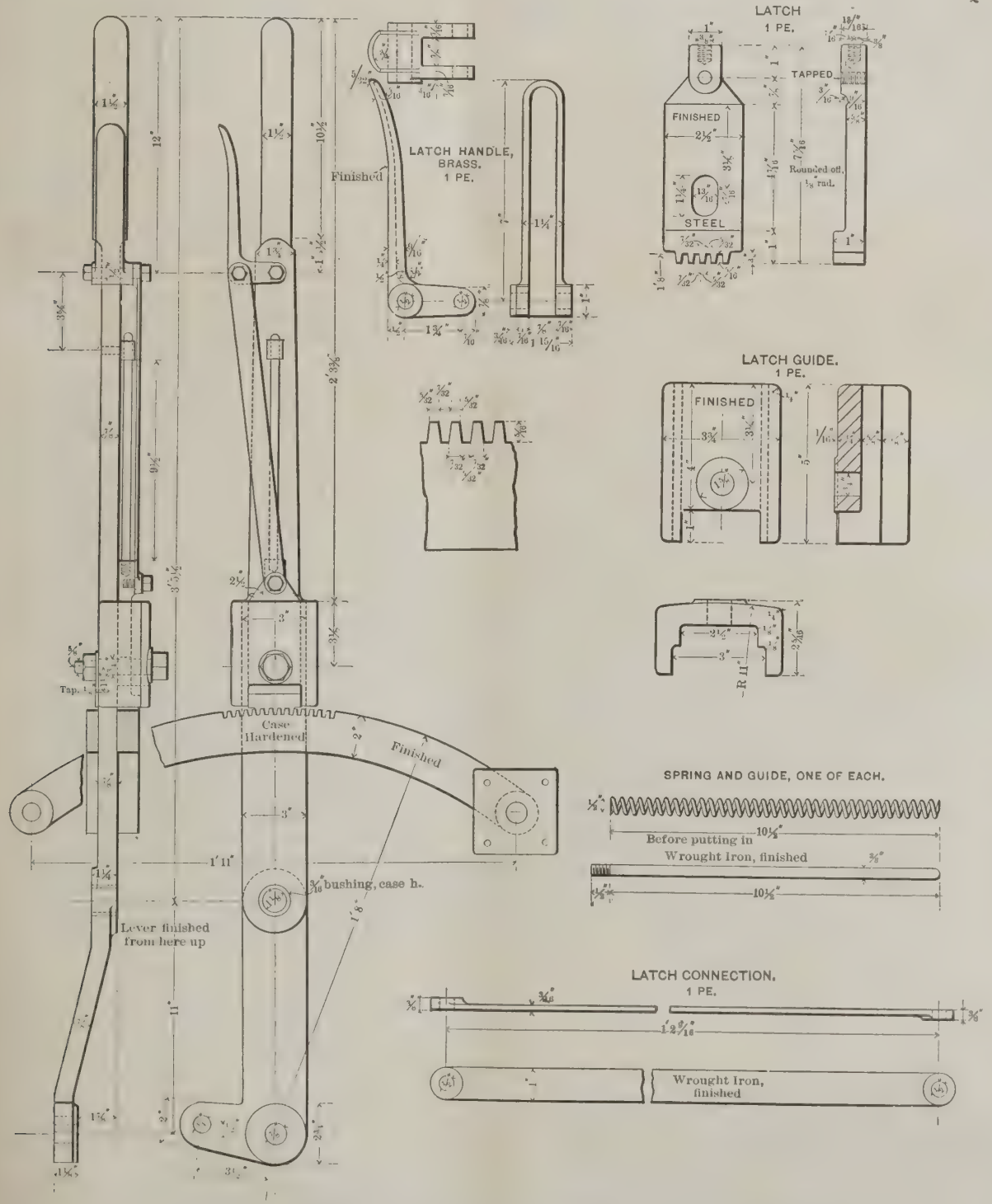
We present herewith drawings of the standard reverse lever quadrants of the Southern Pacific and Chicago, Burlington & Quincy railroads. Probably none of the railroads in the United States have given more intelligent attention to fuel economy in locomotive operating than these two roads have within the last few years. The matter of credit for doing so does not need discussion. The excessive cost of coal on one, due to its being remote from mines of coal, which involved a long and expensive haul, and the financial affairs of the other, imperatively required the strictest economy in fuel.

Both of these roads found that among the first steps necessary to be taken was to have the engineers appreciate the importance of using steam, while running, with the shortest cut-offs practicable consistent with the work required, and making the engines do the work cutting off thus by giving a full throttle.

Immediately this was undertaken all sorts of objections were raised, and some with very good reasons. Prominent among these were such as, "She's too hard on the fire with a full throttle.' "My engine burns more coal and uses more water when I pull her wide open." "My engine works too strong in the regular working notch with a full throttle, and in the next notch back she won't do the work." As the first principle of fuel economy required that an engine would not be "too hard on her fire," and not "work too strong," burn more coal and use more water in being operated in the manner advocated than when steam was throttled and later cut-offs employed, the matter was carefully looked into, and it was found that the men had simply stated the facts in the case and that the trouble was in the location of the notches on the quadrants.



STANDARD REVERSE LEVER AND QUADRANT, SOUTHERN PACIFIC RAILROAD.



STANDARD REVERSE LEVER AND QUADRANT, C., B. & Q. R. R.

Examination showed that these notches were generally spaced so as to cause a variation in the cut-off of steam of from two to three inches in changing the reverse lever from one notch to another, and this so largely affected the working of the engine that it was often impracticable to keep the throttle full open, as in one notch too much power would be developed, and a too strong draft created upon the fire and the steam producing capabilities of the boiler, and yet in the next notch toward the center insufficient power would be developed to do the work required.

These were the results obtained with the quadrants, common on nearly all engines in this country, having notches one-half inch in cross-section and spaced all the way from one-half inch to one inch apart, so that the distance from the centers of notch to notch ranges from one to two inches.

To overcome the difficulty quadrants were applied with notches of one-quarter inch cross-section and spaced one-quarter inch apart, as shown in the drawings, thus closing up the distance from the centers of notch to notch to but one-half inch, which effects a variation of cut-off of but about one inch.

This style of quadrant proved so satisfactory in service, and aided so largely in the economical operating of the locomotives, that it has, with the variations shown in the two drawings, been adopted as a standard by each company.

The cost of the C., B. & Q. quadrant is as follows:

Close notched quadrant	$4.36
Change of reverse lever	7.22
Total	$11.58

The above includes 25 per cent. added to labor for uncharged time.

The cost of the Southern Pacific quadrant is reckoned at ten dollars.

A Railroad to Damascus.

While the railroad between Joppa and Jerusalem is still building, a more ambitious project is about to be inaugurated in Palestine. English capitalists have secured a concession giving them the right to build a railroad from Acre, on the coast, to Damascus. The bay of Acre is eight miles across, and penetrates the coast for three miles. On its north side is the famous town of Acre, the last stronghold of the Christians in Palestine in the time of the Crusaders. On the south side of the bay is the walled town of Haifa. The railroad is to commence at these two places. It will unite after a few miles, and then proceed along the eastern foot of Mt. Carmel, past Nazareth to the River Jordan, along the eastern shore of the Sea of Galilee, and thence across the plain of Damascus to the big city. Damascus will be the terminus of the line for a while, but it may be indefinitely extended at some future time, as it is believed this route will be the beginning of a trunk railroad to connect the Mediterranean and the Persian Gulf.

The railroad to Damascus will be about 120 miles in length, 110 of which will run over plains, leaving only 10 miles of rough work. The country to be served by the railroad is very fertile and productive. Damascus has a population of 250,000, and the country through which the railroad is to run contains about 1,000,000 inhabitants.

A Solid Silver Railroad Pass.

The Silverton Railroad and the Rio Grande Southern companies, of which Otto Mears is president, have a combined mileage of 223 miles. Mr Mears issues the most beautiful annual passes used on any road in the world. This year the pass is a highly polished solid silver plate, made of Colorado silver by native workmen. The border is in artistic Mexican filagree silver work. The name of the recipient is engraved on the central plate. There are no sordid cautionary "conditions" on the reverse side of this dainty pass, warning the holder that in accepting this he "releases the company from all liability for personal injury." This invitation is as generous and free as the winds of the Colorado mountains, through which the road runs.—*St. Louis Republic.*

The plant of The Grant Locomotive Works at Chicago has just been completed, and is now equipped with facilities for building 250 locomotives per year. The plant is well provided with modern tools and conveniences for doing first class work. Special attention is to be given to general repairs of old work.

Passenger Car, New York Central & Hudson River Railroad.

[WITH INSET.]

Our supplement this month shows the general arrangement of the standard passenger car of the New York Central & Hudson River Railroad, which was illustrated in detail in the May issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

We reproduce a part of the description appearing in our last issue to refresh the memories of those who may have forgotten what was then said.

The car is 54 feet long and 9 feet 6 inches wide, measuring in both cases over the sills; the distance from the top of the sills to the bottom of the plate is 6 feet 6 inches. The extreme dimensions are: Length, 61 feet over the buffers; width, 9 feet 10⅛ inches over the eaves; height, 13 feet 11 inches from the rail to the top of the deck.

The interior of the car is finished in mahogany throughout, excepting the ceiling, which is of oak veneer. The design of the woodwork is not very elaborate, but substantial, and the effect pleasing. The windows have single sash, which are also of mahogany; in place of the usual blinds the car is equipped with curtains, which are mounted on Hartshorn spring rollers. The window posts being sufficiently wide to afford ample space for the curtains, no unsightly boxes are required for these.

There are two toilet rooms, finished to correspond with the woodwork in the body of the car, and, contrary to the usual practice, both are located in the same end of the car. The seats are Hale & Kilburn's No. 73, and the trimmings are of bronze. Ventilation is provided for in the usual manner, that is, by movable deck dashes, which are hung with ratchet pivots, by drop sashes in the end doors, and by the additional end ventilators located in the platform hoods. The toilet rooms are provided with a 5-inch globe ventilator each.

These cars are warmed by direct steam obtained from the locomotive, and are equipped with the Pintsch light, which has been adopted by this company. There are five 4-jet lamps in the body of the car and a 2-jet lamp on each platform, the latter being contained in a dome similar to that used for vestibuled cars.

The cars are mounted on four-wheeled trucks, having a 7-foot wheel base and steel-tired wheels. The trucks are constructed in the usual manner with plated wheel pieces, etc., and the only noticeable features are the iron transoms and axle safety beams; these members are usually of wood or a combination of wood and iron.

The cars are equipped with the Westinghouse quick action brake and air signal.

Triple Expansion Locomotive.

A triple expansion locomotive has been placed in service on the Northwestern Railway of Belvuchistan, designed by Mr. John Riekie, Locomotive Engineer of the company.

Following are the general dimensions:

High pressure cylinder, diameter	14 in.
Intermediate cylinder, diameter	20 in.
Low pressure cylinder, diameter	28 in.
Stroke of piston	26 in.
Diameter wheels leading	51 in.
Diameter driving wheels	95½ in.
Wheel base	16 ft. 2 in.
Length of grate	5 ft. 2 in.
Width of grate	4 ft. 1¼ in.
Grate surface	8 sq. ft.
Diameter top boiler shell	24 in.
Diameter of two bottom boiler shells	21 in.
Number of tubes	130
Diameter of tubes, outside	1.77 in.

The boiler shell is composed of three separate cylinders joined together and has two domes. The front dome has a valve which will admit steam to both the high and intermediate cylinders, to assist in starting.

The three cylinders are arranged horizontally on the same level, the high pressure cylinder being on the left hand side, the intermediate cylinder on the right hand side, with the low pressure cylinder at the centre. The steam for the high pressure cylinder is taken directly from the two domes. The high pressure and intermediate cylinders are double acting, but the low pressure is single acting.

Master Car Builders' Association.

COMMITTEE ON AUTOMATIC COUPLER STANDARDS AND LIMITS.

This committee held a meeting at Pittsburgh, April 26, in order to meet with manufacturers of couplers and discuss the specifications issued by the committee concerning the construction and tests of couplers. The chairman, Mr. John S. Lentz, being absent, Mr. G. W. Rhodes presided at the meeting. The following representatives of coupler manufacturers were present:

Mr. Geo. C. McMichael, Eureka Coupler Company; Chas. Stilger, of the Stilger-Strosler Coupler Company; Alfred H. Renshaw, Trojan Coupler Company; James Munton, Chicago Tire and Spring Company; W. A. Stevens, Chicago Steel Coupler Comdany; H. C. Gould, Gould Coupler Company; J. K. Boyle and C. W. Roepper, Solid Steel Casting Company; M. A. Kilvert and A. C. McCord, Drexel Railway Supply Company; T. L. McKeen, Thurmond Coupler Company; E. W. Pabst, Schoenberger Coupler Company; E. H. Johnston and J. W. Robinson, Johnston Coupler Company; Chas. W. Taylor, Smillie Coupler Company; J. C. Forsythe, Hinson Coupler Company; H. C. Buhoup and B. B. Kerr, McConway & Torley Company; H. S. Burkhardt, Chicago Malleable Iron Company; W. F. Goodspeed and James Timms, Buckeye Coupler Company; J. Litchworth, Porley Coupler Company; F. S. Wells, California Coupler Company; A. W. Van Dorston, Van Dorston Coupler Company; R. M. Bailey, Union Coupler Company; F. W. Sargent, Congdon Brake Shoe Company.

In explaining the work of the committee the chairman said that during the last meeting of the M. C. B. Association there was a general expression of disappointment at the record the M. C. B. type of drawbar was making, partly owing to the fact that the lines were not closely followed, and also to the poor material which was being used in their manufacture. The result of this criticism was the appointment of this committee. At a meeting of the committee recently held in Buffalo it was decided that if the work was confined to dimensions alone it would not accomplish the desired object, and it was decided to draw up specifications for tests. The idea of these specifications is not to produce a test such as is given in service, but one from which conclusions can be drawn relative to the good or bad qualities of the bar tested. In the pulling test suggested it is not the idea that it is similar to the test a bar is put to in starting a train, but one which provides for the strains produced in slashing back and forth.

The Chicago, Burlington & Quincy Railroad changed from using a strap pocket to the use of a tail pin in their draft rigging, but very soon returned to the strap, as they found it by far the safest and best. The tail pin might be strong enough when made of the best iron or of steel, but there is no assurance that in making repairs another road would use good material, and even the owners of the cars at times may be out of the proper grade of material. With the use of the strap this danger is done away with. A well constructed tail bolt two inches in diameter is apt to break at about 90,000 pounds, while a tail strap 4 inches by 1 will stand 150,000. Tail pins are turned out and running which will break at 30,000.

A general discussion followed of the specifications recommended by the committee, and published in the NATIONAL CAR AND LOCOMOTIVE BUILDER in May. The rules were taken up and discussed separately, and all adopted as read, except in regard to Test No. 3, an amendment that the pulling test be made 125,000 pounds instead of 120,000 pounds was adopted.

In discussing the recommendation of the use of a U strap or pocket, instead of a tail pin for a drawbar fastening, attention was called to the fact that the M. C. B. standard was a tail pin, having been adopted at their last meeting. The opinion seemed to be very general that the strap was preferable, and a motion was carried approving the recommendation of the committee to use the strap.

COMMITTEE ON STANDARD EFFICIENCY OF POWER BRAKES.

This committee consisting of Messrs. G. W. Rhodes, E. B. Wall and George Gibbs, held its first meeting in Chicago, March 25, and the specifications then submitted to brake manufacturers and others interested were published in the April issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER. A second meeting of the committee was held at the Grand Pacific Hotel, Chicago, April 22, which was attended by representatives of the brake companies as follows: Mr. H. H. Westinghouse, the Westinghouse Air Brake Company; Mr. Geo. A. Boyden, the Boyden Air Brake Company; Messrs. Vilas and Massey, the New York Air Brake Company; Mr. J. R. Mason, the Mason Air Brake and Signal Company; Mr. Haberkorn, the Haberkorn Brake Company. Messrs. D. L. Barnes, C. F. Street and W. H. Marshall of the technical papers, and many others interested in power brakes were also present.

The requirements submitted by the committee were taken up one by one, discussed and voted upon by all present, the desire being simply to get an expression of opinion on which the committee could work. As a result of the discussion and the suggestions made the committee has framed another series of requirements as follows:

CONDITIONS OF TESTS.

First.—Brakes will be tested on a rack representing the piping of a fifty 34-foot car train. All cocks, screws, angles and connections will be as nearly as possible identical with those in train service. A drawing will be submitted showing what shall constitute the proper fittings, piping, dimensions of cylinders, auxiliary reservoirs, main reservoirs, engineer's valve, etc.

Second.—Pressure.—Tests will be made with a uniform train pipe pressure of 70 pounds.

Third.—Construction of Triples.—Triples must be constructed so that they can be secured and operated on apparatus conforming to diagram.

Fourth.—To secure accuracy in measurement of time in application and release tests electrical recording apparatus will be used.

Fifth.—Tests shall be repeated at least three times under the same general conditions. The temperature at the time of the tests will be recorded.

Sixth. Release Test.—The following conditions should be observed in this test:

(*a*) Boiler pressure 160 pounds.
(*b*) Main reservoir cut-out.
(*c*) Pumps, 8-inch steam cylinder, 7½-inch air cylinder.

A uniform pressure of 70 pounds having been secured in the train pipe, all the air will be exhausted by an emergency application. The train pipe will then be pumped up to —— pounds, and a record of all brakes that have released taken.

NOTE.—This test, in addition to testing the release feature of the triples, is intended as an equivalent to a break-in-two in train service.

Seventh.—Test to determine the time of charging one auxiliary reservoir.

(*a*) Cut out the car to be tested at the cutout cock.
(*b*) Bleed the auxiliary reservoir empty and close the bleed cock.
(*c*) Secure 90 lbs. pressure on main air reservoir and train pipe.
(*d*) Shut off the pump.
(*e*) Cut in the car to be tested and note from the reading of the gauge the time occupied in charging to 70 pounds; the time should not exceed — seconds, nor be less than — seconds.

NOTE.—The object of this test is to prevent irregular charging of auxiliary reservoirs, and thus assure that the front brakes will not apply after charging.

TESTS.

First Application Test (*a*).—Brakes must commence to apply on the fiftieth car in three seconds, or less than three seconds, from the first movement of the engineer's valve handle and must indicate at least 55 pounds in the cylinder of the fiftieth car in three and one-half (3½) seconds or less from the first move of the engineer's valve handle. This test will be made with

(1) 6-inch piston travel,
(2) 12-inch piston travel,
(3) 4-inch piston travel.

NOTE.—The object of this time limit is to secure in actual service a minimum length of stop and shock and break-in-twos.

Second Application Test (*b*).—Commencing with the fifth car from the engine the air from the reservoirs of three successive cars will be cut out, the brakes will then be applied as per test No. 1. The emergency action should pass these three cars and apply on the fiftieth car in the same time as in test No. 1. Tests will be made with piston travel 6-inch, 12-inch and 4-inch.

NOTE.—In freight service the most common method of remedying a defective break is to cut the brake out; hence it is essential that a limited number of cars can be cut out successively without destroying the emergency feature.

Third. Graduating Test.—Seventy pounds train pipe pressure having been secured, the following tests will be made.

(*a*) A reduction of 10 pounds in train pipe pressure. This should lightly apply the 50 brakes.

(*b*) A further reduction of 4 to 6 pounds. This should increase the breaking power on all the brakes.

(*c*) A reduction to 30 pounds should equalize the pressure between the auxiliary reservoirs and brake cylinders. The piston travel in this test will be 6 inches.

Fourth. Test to Determine the Sensitiveness of the Emergency Valves.—Three valves, selected at random, will be taken for this test, and each tried separately. The engine and tender brake should be connected in.

A train pipe pressure of 70 pounds having been secured, the air will be discharged as rapidly as it may through an opening in the engineer's valve of — inches. Under this condition the emergency action must not take place.

NOTE.—The object of this test is to check the introduction of triples, which will cause an emergency application when not wanted.

Fifth.—Test to determine the holding power of the brake in service application and emergency application.

(*a*) *Service Application.*—Gauges will be placed on the cylinder and auxiliary reservoir of the first, twenty-fifth and fiftieth car, with 70 pounds train pipe pressure, brakes will be applied by submitting as nearly as may be 15 pounds into the cylinder of the first car. Record of pressure in the auxiliary reservoirs and cylinders will then be taken as follows:

(1) At the first application.
(2) In five minutes from first application.
(3) In ten minutes from first application.
(4) In fifteen minutes from first application.

(*b*) *Emergency Application.*—This will be the same as above, except that all the air will be exhausted from the train pipe.

TRAIN TESTS.

In order to provide against defects which a rack test may not develop it is recommended that railroads make a 50-car train test in actual service before accepting the result from the rack test as final.

Second.—In making application tests Nos. 1 and 2 with a train, the measurement of time from the first car to the 50th car should also be provided for. This will determine the time occupied by the engine brake as against the car brake.

Third.—Special care should be taken with the engine and tank brakes in order that they may do their share of the braking during the stops, and not pull away from the train.

Fourth.—All brake shoes must have a proper bearing on wheels, which is best accomplished by giving them some previous service before testing.

Fifth.—Tests to determine the shock should be made on a level track with all the slack in train pulled out at the time the brakes are applied.

The Highest Inhabited Spot.

It was stated in our last issue that the town of Galera, Peru, situated on an Andean mountain 15,635 feet above the sea, and nearly 1,500 feet higher than the hotel on top of Pike's Peak, was the highest inhabited place in the world. Later advices state that Mr. Arthur E. Pearce, an engineer who has been prospecting and making meteorological observations in the Andes, has come across two mining camps which are even higher than Galera.

They are named Vicharrayal and Muscapata, the former 15,950 feet above the sea level and the latter 16,158. Each camp has a population of about 200 miners the year around.

Galera owes its existence to the Galera Tunnel of the Panama & Oroya Railroad of Peru, which pierces the mountain at that point, which is the summit of the road, and which, as before stated, is the highest railroad tunnel in the world.

This railroad, however, is to be surpassed by a narrow-gauge road which is now being built to connect with it, and which will reach an altitude of 15,850 feet at its highest point.

Near Galera there are five mining camps, all the property of one company, and connected by telegraph lines which are said to be the highest in the world. These lines pass over two summits of more than 17,000 feet, and the mean height of the lines is more than 16,000 feet.

The extent of the street railroad interest in the United States may be estimated from a recent report, which states that there are 5,783 miles of such roads in operation, having 32,505 cars and employing 70,764 men. The total number of passengers carried last year was 2,023,010,202, being 349,820 per mile of road, and 62,237 per car.

Railroad Progress in the Argentine.

Americans regard with commendable pride the progress made in the United States during the last 30 or 40 years in all the branches of engineering, the arts of manufacture, and the means of communication and transportation. Progress seems natural here, and we are often so egotistic as to think we are leaving the rest of the world far behind us in our onward march.

This is because our vision is limited and we are absorbed in our own affairs. The fact is that we have had no monopoly of the wave of progress that has swept over our country, but "broad and liberal as the encasing air" it has covered and advanced the civilized nations of the world.

The three illustrations presented herewith show most graphically the progress made in the Argentine Republic during the last 35 years in the means of transportation and the motive power for railroads. Our first illustration is that of a train of peculiarly constructed wagons, loaded doubtless with hides, horns and tallow, crossing the pampas (plains), and utilizing for motive power the strength of patient oxen. The peculiar construction of the wagons shown may appear open to criticism, but in reality this type of wagon was excellently adapted for the peculiar conditions of the service in which it was employed, and should stand as an object lesson for those who believe in standardizing everything under the sun, and who are quick to criticise the methods of others that do not conform to their own. Different conditions require different adaptations to properly meet them. These wagons with wheels eight feet in diameter look outlandish to unaccustomed eyes, but they were found to be absolutely necessary on the pampas of the Argentine in fording streams innocent of bridges, and in passing muddy places on the unimproved roads where stalling and great trouble would be experienced with a smaller wheel sinking to the hub.

ARGENTINE FREIGHT TRAIN BEFORE THE RAILROAD ERA.

The construction of the first railroad in the Argentine, the Western Railway of Buenos Ayres, was begun in 1853 and four years later, August 30, 1857, the first section was opened for the movement of trains, and the locomotive shown in our next illustration, "La Porteña," "The Belle of the Port," pulled the first train, and inaugurated an era of great national progress and prosperity.

This engine was built in 1857 by Manning Wardle & Co., of Leeds. After some thirty years of service it has been put in the best condition possible for preservation, and is now kept as a relic at the principal shops of the railway company at Toloso, about thirty miles from Buenos Ayres.

About the only uncommon features of this engine are that it is 5 feet 6 inches gauge, is equipped with the Smith-Hardy non-automatic vacuum brake, which is largely used in England and South America. The cab is of sheet iron, without closing doors or windows. The feed water is supplied by two No. 7 Sellers injectors, pattern of 1887, and with one brass pump. The latter is intended as a reserve for use in the event of failure of the injectors, and was furnished in accordance with the specifications of Messrs. Tedin & Rapelli, under whose supervision the locomotive was constructed.

There could hardly be a more graphic illustration of Argentine railroad progress than is given by a comparison of the appearance and dimensions of "La Porteña" and Engine No. 96. The larger boiler, cylinders and driving wheels of Engine 96 tell of increased power and speed capabilities required by a large growth of traffic. A nearly three-fold increase of weight tells of stronger bridges, heavier rails and improved roadbed, and, therefore, greater safety, and the larger proportional increase of grate area and heating surface, giving more perfect combustion in the firebox and more heat absorbing power to the boiler, tell of improved economy in management.

We are indebted for the information concerning the dimensions of engine "La Porteña" to Mr. Thomas L. Chubb, Locomotive Superintendent of the Buenos Ayres & Western Railway, and for the information in regard to Engine No. 96 to the Baldwin Locomotive Works:

DIMENSIONS. Boiler:	"La Porteña."	No. 96.
Length	8 ft. 10 in.	
Diameter	22 "	58 in.
No. of tubes	62	204
Diameter of tubes	2 "	2 in.
Length of tubes		11 ft.
Working pressure	120 lbs.	130 lbs.
Grate area	5.48 sq. ft.	18 sq. ft.
Heating surface.		
Fire-box	32¾ sq. ft.	115 sq. ft
Tubes	286¾ "	1,155 "
Total	319½ "	1 270 "
Cylinders	10 in. × 15 in.	17 in. × 24 in
Drivers, diameter	48 "	72 "
Driving wheel base	5 ft. 6 "	7 ft. 8 "
Gauge	5 " 6 "	5 " 6 "
Capacity of tank	315 galls.	2,300 galls.
Capacity of coal pit	425 lbs.	10,000 lbs.
Length, end to end, of buffers	20 ft. 2 in.	53 ft. 3½ in.
Total weight in working order	34,900 lbs.	97,300 lbs.

The system of railroads inagurated by La Porteña has now grown to the following population:

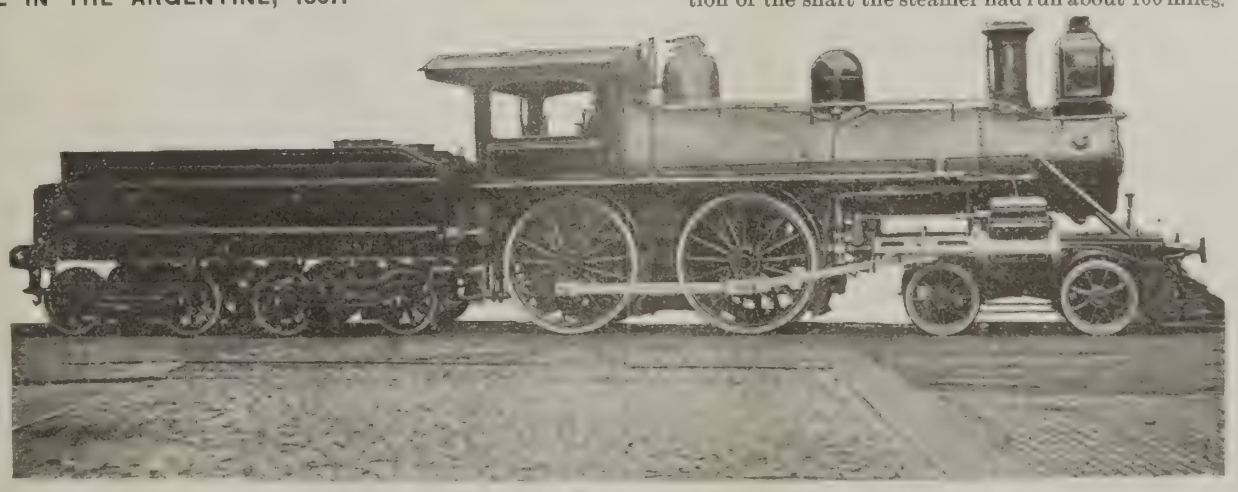
Argentine Railways	*Miles open in* 1892.
Argentine Great Western	319 miles.
Buenos Ayres & Ensenada Port	68 "
Buenos Ayres & Great Southern	934 "
Buenos Ayres & Pacific	426 "
Buenos Ayres & Rosario	843 "
Buenos Ayres & Western (formerly Western Ry. of Buenos Ayres.)	338 "
Central Argentine	711 "
Cordoba Central	678 "
	4317 miles.
Other small lines	3700 "
	8017 "

Lines in construction 1,000 miles.

THE FIRST LOCOMOVE IN THE ARGENTINE, 1857.

Our illustration shows it not as it appeared on the famous 30th of August, 1857, but as overhauled after its days of usefulness were considered passed, and as run out from its stall in the Toloso engine house to be photographed for the NATIONAL CAR AND LOCOMOTIVE BUILDER. The driving wheels are not coupled. The engine is equipped with a hand driver brake operated on the fireman's side. The American headlight in front, and pilots on front and back ends give the engine a rather familiar appearance. A good view of the English form of buffing and coupling apparatus is shown at the back end. The American type of passenger cars in the background, together with the pilots and headlight on the engine, show the influence of American supremacy in railroad rolling stock on South American railways.

The general dimensions of "La Porteña" are given herewith in connection with those of the engine No. 96, shown in our next illustration, which is the latest passenger engine sent to this railway by the Baldwin Locomotive Works.



THE LATEST AMERICAN LOCOMOTIVE SENT TO THE ARGENTINE.

The general tint of the World's Fair buildings will be pale ivory. Several of them, however, will show modification of that color.

The steamship "Tynehead" sailed for Russia early in May with a cargo of flour and provisions gathered by the Red Cross Society for the relief of the starving peasants of Russia. She carried 117,000 bushels of corn, 200 tons of flour and several tons of canned meats, soups, jellies, etc., for use in the hospitals of Russia.

On the new coast line of the Southern Pacific Co., between San Marguerita and Santa Barbara, construction is going on rapidly. The road is to be 110 miles long. It will require about two years to complete it, as a great deal of tunneling must be done. The new road will furnish the Southern Pacific two lines to Los Angeles, and will also open up a new and thriving country. The expenditures on the new road and on the other improvements, it is said, will amount to from $4,000,000 to $5,000,000.

The journal on the main shaft of an Atlantic coast line steamer becoming heated, a stream of water was applied upon it for the purpose of cooling it. The steamer made the remainder of its trip successfully, but on examination it was found that contraction from the chilling effect of the water had cracked the journal longitudinally and transversely, and that one of the former cracks extended through the shaft, which was 14 inches in diameter and 22 inches long, to within 2 inches of one outside edge, and with that portion of the shaft the steamer had run about 100 miles.

Coal Consumption of Locomotives.—III.

BY GEORGE H. BAKER.

(Results of Improved Management.)

It may be said that the plan of education, as outlined in the previous papers, is too elaborate, and that the questions of management are of too scientific a character to have locomotive enginemen understand them properly, or be thereby educated to a higher efficiency. This objection has been made. In the practical operation of the plan, however, on several railroads, it was found to be unjustified by experience.

On the Chicago, Burlington & Quincy Railroad, where the plan was tried, 90 per cent. of the enginemen proved on examination to have a very clear conception of the principles involved. They proved, too, in the practical operation of their engines that the instructions given were as good practice as they were correct theory, and the reduction in the coal consumption, figured on the basis of pounds of coal consumed per loaded car hauled per mile, was very gratifying to the officers of the road and very creditable to the engineers and firemen.

The plan of education was undertaken with the new set of enginemen that replaced the old enginemen who left the service of the company on strike February, 1888. The following tables, copied by permission from the reports of the machinery department show the saving effected.

Table 1 shows the improvement and consequent saving effected in the year 1889, when the men were instructed, as compared with the previous year before they were instructed in economical methods of management.

The average temperature was 7 degrees warmer during 1889 than during 1888, which, of course, was favorable to reduced coal consumption, but the most liberal allowance for the effects of this can attribute but a small fraction of the saving to it. Some of the saving was due to the men becoming more used to the road, the engines and their duties during the second year of their work, 1889; but the bulk of the saving was due to their abandoning wasteful practices when the evil results of the same were pointed out, and to practicing the economical methods advocated.

TABLE 1.

For the years 1888 *and* 1889.

COMPARISON.

	Average pounds of coal per car mile. Freight.	Passenger.	Average temperature.
1888	6.65	15.63	52°
1889	5.95	13.23	59°
Difference	.70	2.40	7°

SUMMARY.

1889.	Pounds of coal saved per car mile.		Loaded cars hauled 1 mile.		Tons of coal.		Cost per ton.		Saving.
Freight	.70	×	161,708,025	=	56,598	×	$1.40	=	$79,237
Passenger	2.40	×	20,012,663	=	24,015	×	1.40	=	33,621
Total saving									$112,858

As proving that the saving shown in the foregoing table was not due in any great measure to the normal improvement of the men from simply getting used to things, Table 2 is arranged. No instructions about economical operating were given until April, 1889; so January, February and March were passed under the same conditions as the whole of the previous year. But the men had been at work now for over a year in their respective capacities, and no further great improvement could be reasonably expected of them if left to themselves. They were doing the best they knew how. Yet when the coal consumption of the engines for this period (the first quarter of 1889) is compared with the consumption for the corresponding period of the following year (first quarter of 1890), as in Table 2, when all had been thoroughly instructed, the difference is noticeable.

TABLE 2.

For the first quarter of 1889 *and* 1890.

COMPARISON.

	Average pounds of coal per car mile. Freight.	Passenger.	Average temperature.
1889	7.14	15.61	30°
1890	6.70	13.74	37°
Difference	.44	1.87	7°

SUMMARY.

	Pounds of coal saved per car mile.		Loaded cars hauled 1 mile.		Tons of coal.		Cost per ton.		Saving.
Freight	.44	×	44,384,232	=	9,764	×	$1.40	=	$13,669
Passenger	1.87	×	4,845,116	=	4,530	×	1.40	=	6,342
Total saving									$20,011

Early in the work of educating the men the prediction was made that when the work was completed, and the men fully instructed, they would operate the engines more economically and with less coal consumption than had been done by the old set of enginemen who had grown up in the service of the company, because the new instructed men would be better informed and more efficient. But this was thought impossible by some of the officers, because the tonnage per car mile was greater then than two years before with the old men, both for home and foreign cars hauled, and the speeds of trains were faster than ever before; and it was thought that if the coal consumption per car mile could be reduced to what it had been with the old men, the new men would certainly be doing more work with the fuel used than the old men had done. The old men, too, had been paid coal premiums, on the Chicago division, to induce them to be saving of coal, while the new men had no such inducement.

The following table, however, shows that the expectation of a betterment by education was realized in no uncertain manner.

TABLE 3.

For the last quarter of 1887 *and* 1889.

1887. Old set of enginemen, part paid premiums,
1889. New set of enginemen, instructed, no premiums.

COMPARISON.

	Average pounds of coal per car mile. Freight.	Passenger.	Average temperature.
1887	6.03	13.33	39°
1889	5.86	12.78	51°
Difference.	.17	.55	12°

SUMMARY.

1889.	Pounds of coal saved per car mile.		Loaded cars hauled 1 mile.		Tons of coal.		Cost per ton.		Saving.
Freight	.17	×	46,791,577	=	3,977	×	$1.38	=	$5.488
Passenger	.55	×	5,097,607	=	1,402	×	1.38	=	1,934
Total saving									$7.422

While it is true that the average temperature for the quarter of 1889 was 12 degrees warmer than for the quarter of 1887, yet it is more than likely that the harder conditions of service in 1889, resulting from increased weight and speed of trains, more than neutralized the favorable effects of these few degrees of warmer temperature; and we may reasonably consider the $7,000 saved in this short time as a part of the value of the superior efficiency of the instructed new men over the old men as they were in 1887. The whole expenditure made to secure the improvement shown in the foregoing tables was less than $3,000.

It would appear that this was a rather profitable investment, but in matters of this kind a year's record is not the measure of the good accomplished. As long as interest in the matter is kept up and officers are duly appreciative the good work goes on, and is felt in better treatment of boilers and machinery, decreased coal consumption, a more judicious use of supplies and better service generally.

This results in as much good to the men as to the officers of the road and naturally brings about kinder feelings and closer relations, all knowing that they are working for a common end—the best interests of those for whom they labor and those they labor with.

Draft Gears for Freight Cars.*

BY D. L. BARNES.

The reliability of the connection between the cars of railroad trains should be of interest to all who are connected with railroads in any capacity, as upon it depends the safety and the rapid movement of passengers and freight. Weak draft gears and couplings frequently cause delays and wrecks, which give trouble in all departments, and in some instances have materially increased the extent of a car famine, and in various ways, directly or indirectly, an inadequate connection between the cars of a train causes much annoyance to both shippers and carriers. Reliable information obtained from the headquarters of some of our largest railroad lines shows that often from 60 to 70 per cent. of all the cars standing idle for repairs have been taken out of service because of defects in some portion of the draft gear. This is reason enough for the statement that not enough attention is now given to the construction of the types of draft rigging commonly used, or a strictly new type is needed.

The variation in design and dimensions of the present forms of draft gear is to be regretted, as it increases the repair account and delays repairs. The number of pieces per car varies from 60 to 300, and the weights from 200 to 1,250 pounds. One type of gear has 234 pieces of forgings, 62 pieces of castings and 6 pieces of timber per car.

Perhaps it is not the weakness of what is more strictly speaking the draft gear that causes a majority of the failures in service; it may be that the cause lies in the sills, as it is noticeable from an examination of cars on repair tracks that the timber of both the draft and center sills taken out is fractured and broken, yet it is generally of a better quality than when first put in. It is, in fact, a high class of seasoned lumber, such as cannot be purchased in the open market. The timber which is put in place of that taken out is not of as good quality as that which is removed; hence the process of repairs is a substitution of unbroken green timber for fractured seasoned timber. Does not this indicate that either we are not using a size of timber large enough to withstand the shocks, or that the timber is badly placed to resist the strains that are imposed upon it? This is a question which should be answered before a standard car or draft gear is selected. An illustration of the weakness of the timbers used is found in Figs. 45 and 46, where is shown the fracture of a car framing in a collision without injury to the draft gear. This was a light pressed steel gear, yet it evidently was stronger than the timbers of the framing.

On account of the varieties of designs and the failures in service, the indications are that the Master Car Builders' Association will soon be compelled to consider some means for the improvement of the draft gear of freight cars. It is noticeable from the records of the Association that it has investigated the construction of parts of cars whenever the results of service have shown them to cause an unusual amount of annoyance. Annoyance may result from weakness of parts or great variety of designs and dimensions. A vast array of new designs usually follows a display of defects. This is, of course, desirable, as it leads to improvements in construction, but there must generally follow some steps taken by the Association to reduce the number of types in service. This reduction is most quickly brought about by the adoption of a standard design, and it is the possibility of a standard draft gear of a radically improved type to make with the vertical plane coupler a reliable connection between cars that gives to this subject so much interest.

It is impossible within the scope of a paper of this kind to describe in detail the different kinds of draft gears now in use. Only the more prominent ones can be selected, and but little can be said of each by way of description.

The first to be considered is the form of draft gear which some years ago was almost a standard. It consists merely of two castings bolted to the draft sills by five-eighth inch bolts. The followers are held in position by two binders, one above and one below. Perhaps no better illustration of the increase in the strains and blows of freight service could be offered than by calling attention to the fact that this comparatively weak and inefficient draft gear was formerly sufficiently strong to do good service. To-day it is wholly inadequate, and has but a fraction of the resisting power that is possessed by some of the other designs here shown. This old form when used in present service soon becomes loose and by a wedging action produced by the bending of the follower plates causes a spreading and splitting of the draft timbers.

The draft gears now used may be divided into four classes with reference to their capacity for absorbing blows: First, those of normal capacity; second, those of increased capacity having two or more springs; third, those of still greater capacity with the anti-reaction feature having friction devices; fourth, continuous buffing gears.

Yet this is not a satisfactory classification, as it does not hold good for buffing blows when a buffer stop is used on the couplers. This is for the reason that comparatively light blows, such as are of common occurrence, will drive the buffer stops on the couplers against the end sills; therefore the more severe blows which do the real damage must be taken by the end sills and the buffer stops, and not by the draft rigging. Hence, when buffer stops are used on the couplers, there is but one class of draw gear with regard to blows; viz., *continuous* buffing gears.

The Graham.—This draft gear is one of the strongest made and is used with much success on the Pennsylvania lines, New York, Lake Erie & Western and some other roads. Before the introduction of this gear on the Pennsylvania road about 75 per cent. of all the cars laid up for repairs were thrown out of service because of failures of draft rigging and breakage of center sills to which the draft timbers were attached. The inventor of this rigging sought to design a gear that, while strong in itself, would, in case of violent shocks, break before damage was done to the center sills and the other more expensive parts of the car. With it buffing stops of cast iron are used to distribute the shocks to the center sills and thus avoid breakage of the body bolster. When this device was first brought out it was severely tested at Altoona, and it is now standard for the Pennsylvania lines east and west of Pittsburgh. It is now in use on about 50,000 cars, and old cars when in the shop for repairs are frequently equipped with it in cases where the center sills are not fractured for more than 2½ inches in length. On cars so equipped it has been found that the cracks extend no further. Taken all together, this gear is probably the strongest made for strictly wooden car construction, The arrangement of the different parts is as follows:

There is a center timber which extends from the end of the car to a point somewhat back of the body bolster. This is securely bolted to the center sills. The drawbar stops are more strictly speaking, "buffing stops." They bear on the center timber which distributes the shocks to the center sills. These buffers have projections which are let into the draft timbers. Through these buffers pass the cast steel followers between which the spring is placed. This gear is adapted for use with a tail bolt at present but can be used with a strap. The draft sills are keyed and bolted to the center sills, as shown. The ends of the draft sills butt against the body bolster, which is mortised into a buffing timber.

The Butler.—This attachment belongs to the type where the spring is inclosed in a casing. It consists of a casing made in halves and of malleable iron, in which are inserted two followers, one at the front and one at the rear. This arrangement is adapted for either a tail bolt or strap. When a tail bolt is used it passes through the center of the spring and the centers of the followers. The casings are held together by bolts passing through holes provided at the four corners and through the draft sills. This is one of the simplest forms of drawbar attachments used with wooden draft timbers, and when there is a buffing blow sufficient to break some portion of the car framing, it is the draft sills which give out, and not the attachment. It is now in use on over 100,000 cars, and has been adopted as standard on 25 roads.

The Canda.—This gear is also of the kind where the spring is incased. In this the casing is made in four parts, and so arranged that a draft spring can be removed without taking the drawbar attachments away from the draft sills. The spring is placed between followers and held in the casings, which are interlocked by projections in such a way as to distribute the buffing strains evenly over the side casings, which are rabbeted into the draft sills. This arrangement is adapted either for a tail bolt or for a tail strap. One advantage of this form of incased spring is that the springs can be removed and replaced without removing the gear from the draft sills.

The Cushing.—This gear belongs to the type where the drawbar stops are formed in one piece for each side. In this case they are made either of cast steel or malleable iron with a removable binder on the bottom. These castings are rabbeted into the draft sills and secured by bolts. This gear is adapted for either the tail bolt or tail strap. Both the forward and backward stop are in one piece, and the strength of one adds to that of the other. With this a draft spring can be readily replaced by removing the binder below.

The C., B. & Q.—This gear is made wholly of wrought iron, bent in a bulldoser. It has the same advantages that are possessed where the forward and backward stops are cast in one piece. In this case the stops are formed of pieces of wrought iron, bent to the form shown in Fig. 13. These are bolted to the face plates, shown in Fig. 14, which are in turn bolted to the side sills, as shown in Fig. 15. This gear is adapted for use either with a tail bolt or tail strap, and the draft springs can be removed and replaced without removing the drawbar stops from the sills. Tests of this gear have shown its capacity to be about 150,000 pounds, and a large number of them are in use on the C., B. & Q. Railroad. Being wholly of wrought iron or steel, it is not liable to fracture, and it is not loosened by service, owing to the great area of bearing against the draft sills.

The Schoen.—This is made of two forms. One where each drawbar stop is pressed in one piece of steel about ⅜ of an inch thick, with projections which are rabbeted into the draft sills, and a recess for the followers. The followers are of peculiar form, which give great strength with a reduced weight. With this gear there are U-shaped straps sometimes used, which tie the draft sills together and are secured by the horizontal bolts passing through the stops. These keep the sills from spreading. Either a tail bolt or strap can be used with this form, which finds its great advantage in the simplicity of construction and minimum weight. It is probably the strongest gear now made for its

* Read before the New York Railroad Club at a regular meeting, May 19, 1891.

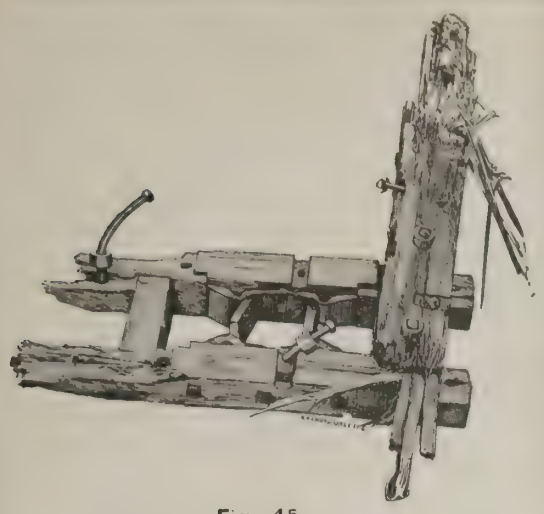


Fig. 45.

Fig. 46.

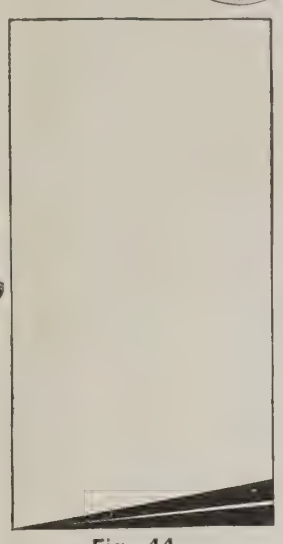


Fig. 44.

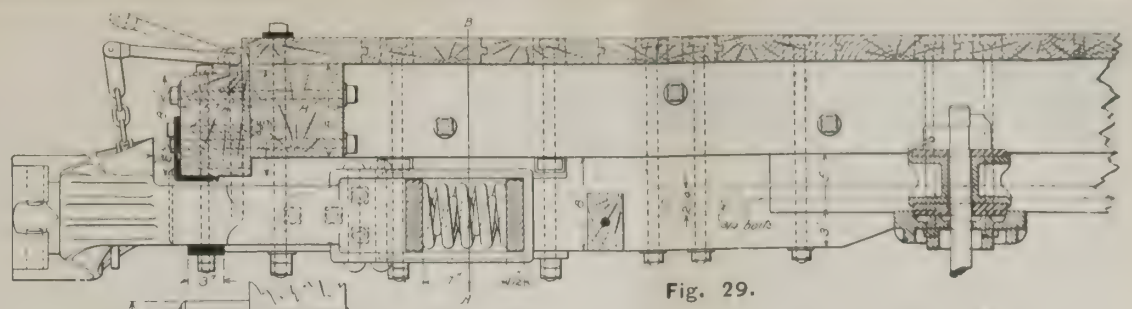


Fig. 29.

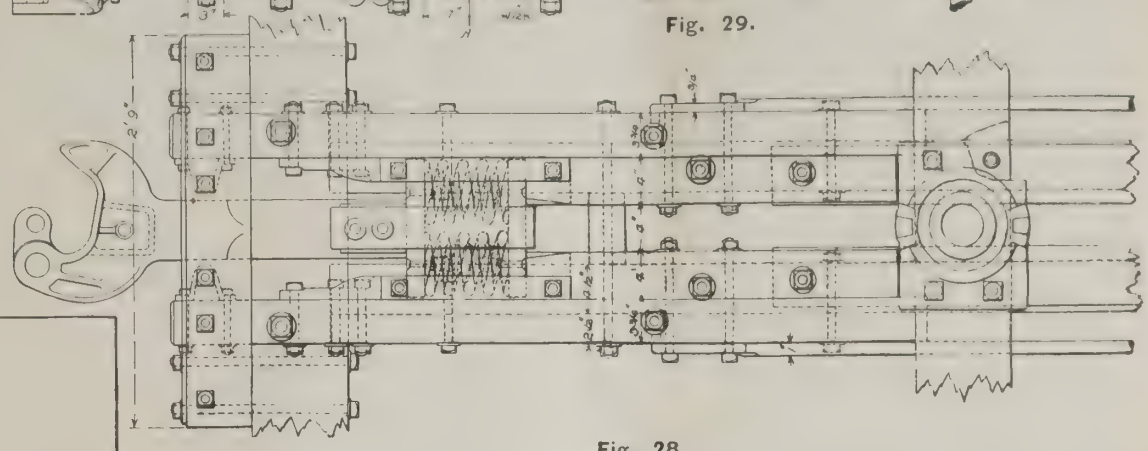


Fig. 28.

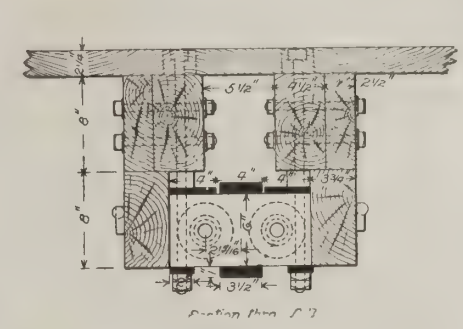


Fig. 30.

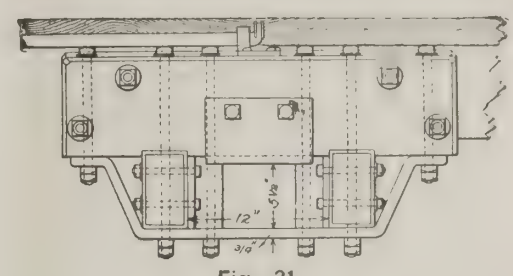


Fig. 31.

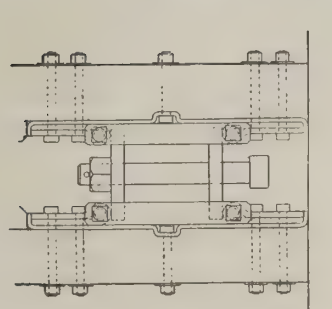


Fig. 15.

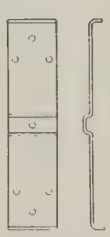


Fig. 14.

Fig. 13.

weight. With this form the drawbar stops have to be removed from the draft sills in order to replace a broken draft spring.

The second form of the Schoen draft gear differs from the form just described in having separate binders at the top and bottom, which are secured in the usual way with the vertical bolts, and which permit the draft spring to be replaced without removing the drawbar stops from the draft sills. It is adapted for either a tail bolt or tail strap.

The Harvey.—This gear is made of steel bent in a bull-dozer and pressed to the form required. There is a filling piece which is inserted in the triangular recess between the draft sill and the face plate, through which the vertical and horizontal bolts pass. It is adapted for a metal draft sill. When used for a wooden sill it is rabbeted into the sill, as usual. It can be used either with a tail bolt or tail strap, and the broken shaft springs can be replaced by removing the bottom binders. When attached to a metal sill it is riveted to the sill and to an angle iron under the sill.

Hinson.—This gear has the drawbar stops cast all in one piece, either of cast steel or malleable iron. The stops are rabbeted into the draft sills and secured with bolts. It is adapted for use either with a tail bolt or tail strap, or with a tail strap having a key at the back end. In the latest form the strap is doubled over on itself at the back end to give greater strength and a larger bearing for the key. It has been aimed to give this gear additional capacity by the use of a U-shaped spring, which is recessed into the draft timbers. When the drawbar followers have been driven back or pulled out nearly to a closed position they come in contact with the ends of the U-shaped spring which projects forward into the space between the draft sills. The additional capacity of this spring is about 20,000 pounds pressure acting through one-half of an inch, or about 833 foot-pounds. This is a small proportion of the needed capacity, as will be shown later. In the latest form the lower part of the stop can be removed to facilitate the removal of the U-spring.

The Lake Shore.—This is a very strong arrangement and is made more particularly to resist buffing blows. As shown in Figs. 28, 29, 30 and 31, the back follower is resisted in its motion by additional pieces of timber placed inside of the draft sills and extending back to the body bolster. These are rabbeted into a sub-sill which is placed under the center sills, thus forming a continuous buffing timber which relieves materially the strains on the draft timbers. Two springs are used with this gear. They are placed side by side, and the center sills are placed 12 inches apart to give room for these springs. Drawbar stops of any form may be used with this gear. It is adapted for a tail bolt or a tail strap.

The Chicago & Northwestern.—We have not a drawing of this gear, but it is made of cast iron or cast steel with the stops rabbeted into the sills. It has two draft springs, only one of which is used in pulling, but both come into action in buffing. It is used on a large percentage of the Chicago & Northwestern equipment, and has reduced materially the repairs to draft rigging, owing to the security of the attachments to the draft sills.

The Westinghouse.—In general this form consists of a series of plates which are interlocked with each other above and below the center line of draft. Under normal conditions there is no lateral pressure on these plates, but as soon as the drawbar is moved inward the plates are compressed together, causing considerable friction which resists further movements of the drawbar. It is adapted either for a tail bolt or tail strap, and for wooden or metal sills. The draft sills, as ordinarily used, are replaced by a channel iron or cast-steel draft sill. To these are riveted the drawbar stops. Of course, this is one of the strongest gears made, as it is almost entirely of steel and is securely riveted together. It has a high capacity owing to the addition of friction plates to the usual draft spring. A number of these have been put into service in the old form, and some are being tried of the new form which has just been brought out. This gear is particularly interesting owing to its theoretical perfection. Of course, its practical value remains to be determined. It is theoretically perfect owing to the fact that it aims to absorb the blow in the strictest sense and to thus remove the recoil after a shock. To this gear and other gears of increased capacity, further reference is made in what follows:

The American Continuous.—This gear aims to form a continuous draft gear throughout the train in pulling. It is strong under buffing blows, as there are timbers provided which transmit the buffing blows directly to a sub-sill under the car, reaching from end to end, without subjecting the draft spring to the shock. The continuous part of the gear is formed by the rods which connect to a cross equalizer. The results from this gear are admirable, and it has proved conclusively the great value of a continuous draft rigging in reducing the breakage of draft timbers. It is the only form of continuous gear that is used to any considerable extent.

The alternative connection, shown in these illustrations, namely, the tail bolt vs. the tail strap, now demands attention, as the breakages of tail bolts are frequent and expensive. The preliminary report of the committee appointed by the Master Car Builders' Association on vertical plane couplers commends the use of the tail bolt instead of the tail strap. The bolts break in various ways, but under the heads and through the keyways principally. Yet in a majority of all cases of broken tail bolts the cause has been bad workmanship or bad material. The bad workmanship has been permitted by lack of inspection on the part of railroad companies purchasing cars, and bad material has been permitted for the same reason. The bad workmanship shows itself in the reduction of the size of the bolts where the key-way is punched and in the bad usage which the material receives where the head is formed. In some cases the heads have been pulled off the first time the cars were hauled. Probably the tail bolt will be discarded, as it must be well made and of good material in order to be even reasonably safe. With the tail strap it is different. It is easily made without injury to the material, and owing to the greater amount of material used there is a greater margin of safety.

The use of dead blocks to receive the buffing blows is a matter of universal interest now, as with them on all cars the draft gear and couplers are supposed to be relieved from all severe blows, and this is generally true with this exception: A dead block with a vertical plane coupler is of no value when the couplers come together with the knuckles closed, as the compression of the draft springs is not sufficient to permit the dead blocks to come in contact. But, except for this, the general statement is true that wherever cars are fitted with dead blocks, properly placed and of proper length, all the buffing blows that are of any considerable magnitude are resisted directly by the sills without the intervention of springs of any sort. One unsatisfactory feature of our present standard vertical plane coupler is that it cannot be protected under all conditions by dead blocks.

It then appears that when couplers are provided with a buffer stop, as all couplers should be, that buffer should form the protection to the draft rigging. We have seen that in ordinary service the buffer stop on the coupler is nearly always forced against the end sill, and however strong the draft gear may be, or however weak, it cannot offer assistance in resisting blows until the buffer stop on the coupler is driven into the end sill. Where the end sills are properly protected by angle irons or plates, cars will run many miles before the buffer stops are driven into the end sills as much as one-half an inch. This brings up an important question. Should not the draft rigging be so devised that it would not close up to a fully closed position so as to receive a buffing blow until after the buffer stop on the coupler has been driven into the end sill at least one-half an inch? If a draft rigging were arranged in this way, and the plates on the end sills were kept up, there would be less talk about draft gears having a high resisting capacity and less damages to draft appliances, as they could only receive severe buffing blows after the buffer stop on the coupler had been broken off or driven into the iron plate on the end sill at least one-half inch.

Unfortunately, this subject has received but little attention, and cars are being built with buffer stops on the drawbars without any protection in the way of metal plates on the end sills, and with such dimensions that the draft rigging is closed up when the buffer stop comes against the end sill. With this bad practice the wooden end sill soon pounds away, and the entire blow is forced upon the draft spring and rigging, which soon gives way and is driven back under the car as fast as the buffer stop wears away the end sill. Evidently the way to prevent this is to have a close inspection to insure a proper placing of the draft gear and the use of metal plates on the end sills.

Those who favor high capacity draft springs and appliances for absorbing blows other than that provided for by the buffer stop will be interested in noting what it is possible to accomplish in this direction. For this reason a diagram, Fig. 44, has been prepared, which shows the capacity of one and two draft springs to absorb the blow delivered by a loaded 60,000-pound freight car moving at about four miles per hour. The area of each of the two small triangles at the bottom of the diagram represent the capacity of one draft spring of ordinary dimensions to resist a blow before it is closed up. The large rectangle shows on the same scale the amount of the blow which can be delivered by a 60,000-pound freight car moving at about four miles per hour. This is a speed at which couplings are frequently made, and at such speeds no real damage is generally done either to the car or to the draft gear. A comparison of the area of the large rectangle with the area of the two small triangles shows how much greater is the blow than the capacity of the draft springs on the two colliding cars to absorb it. This relates to the ordinary gear with one spring. The capacity of gears with two springs would be represented by twice the combined area of the two triangles. With two springs per gear there would still remain a large percentage of the comparatively light blow at four miles per hour to be absorbed wholly by the draft timbers, the sills, the buffer stop or the dead blocks according to which of these is interposed to take it. Devices have been brought out of still greater capacity than that given by two springs, such as the Westinghouse friction buffer, which is correct in theory, as it aims to actually absorb the blow without injurious reaction, such as takes place when springs of high capacity are used. The theory of the friction buffer is correct, but it remains to be seen whether a sufficient capacity can be given to that buffer to absorb the large percentage of the shock, which is illustrated by that portion of the rectangle remaining above the combined area of the two small triangles on Fig. 44.

One point remains to be considered; it is the continuous draft and continuous buffing gear. The American is the one most extensively used. In buffing the blows are taken

(*Continued on page* 95.)

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

REVERSE-LEVER QUADRANTS.

American locomotives have reached their present stage of advanced development through the gradual improvement of details. There have been no rapid strides or radical changes, and yet in comparing a locomotive of to-day with one of twenty years ago the growth and the improvement that progressed so gradually is so apparent in nearly everything we see about it that we wonder at the change.

From the headlight to the coupling on the back of the tender nearly every part and detail has received careful attention, and has been improved so as to most efficiently perform its respective functions in harmonious relation to the operation of the whole.

That is a beautiful thing to say, and it would be still more so, being true, if it was not qualified by "nearly." But the fact is that in all this admirable growth and improvement, one very important detail has been, generally, entirely neglected. Reverse lever quadrants are made and used to-day with little or no improvement over their simple form as when first applied to link motion engines many years ago. They had notches in them then to receive the reverse lever's latch, and allow of certain changes in its position to regulate, in a rough way, the admission of steam to the cylinders. They have such notches now that accomplish the same object in the same way. Evidently the impression has been, and continues to prevail, that the quadrant performs a very simple duty, and one of little importance to the efficiency or economy of the engine. There never was a more mistaken impression.

Economy in the management of locomotives depends more upon the manner of the use of steam in the cylinders than upon any other one condition that can obtain with a well designed engine. While compound locomotives offer in their way to accomplish the best practicable use of steam, the general tendency to improve the simple locomotive to its highest efficiency is unchecked, and stronger and more expensive boilers are being built to safely retain the highest pressure of steam that it is practicable to employ. This is a very large step in the direction of progress and economy, but high pressure of steam in the boiler alone is useless, and unless it is admitted to the cylinders at as near as possible the pressure to which it is raised in the boiler the expense of fuel in raising it to that pressure, and for a boiler to safely retain it, is all in vain so far as fuel economy is concerned.

Steam raised to a high pressure in the boiler and throttled to a lower pressure before reaching the cylinders accomplishes, practically, no useful purpose by virtue of the higher pressure it possessed in the boiler. It is simply the old story of the wheel not grinding with the water that is passed. The water must be on the wheel, and the pressure in the cylinder.

The present general practice does not satisfactorily accomplish this, as the steam is habitually throttled on a very large majority of locomotives in the country, and used with a later cut-off than is necessary to make up for it. The engineers are not wholly to blame for this, because with the ordinary styles of reverse-lever quadrant the notches are spaced so far apart that in changing the lever from one notch to another the cut-off of steam to the cylinders is varied about two inches, and this is too much of a variation to allow, with a full open throttle, of the power or speed being satisfactorily regulated by changing the cut-off, and, therefore, throttling becomes a frequent necessity.

We have seen many quadrants that, in this way, were entirely responsible for the throttling of the steam during most of the time the engine was running, as it would only be occasionally that a piece of road would be reached where the engine would work satisfactorily with a full throttle at any cut-off available with the badly located notches of the quadrant; and we state an absolute truth in saying that we have seen quadrants that have, in this way, been responsible for the waste of their weight in gold several times over in causing an extravagantly unnecessary consumption of coal.

On another page we present drawings of two styles of reverse-lever quadrants that have proved very effective in service in remedying the evil here described, and have been adopted as standard on two of the Western roads that give particular attention to locomotive fuel economy.

We commend to master mechanics and locomotive builders a careful consideration of this matter. In the general improvement of the locomotive the quadrant has been too long and too badly neglected. Not one of our great locomotive works turns out a quadrant that properly accomplishes the purpose for which it is designed.

If higher pressure steam is to come into general use the matter becomes additionally important because it will be more important to utilize the full potentiality of the steam, and as an aid and inducement to engineers to so operate their engines that this may result nothing can be of such great service as a close notched quadrant.

THE MECHANICAL CONVENTIONS.

The approaching conventions of the Master Car Builders' and Master Mechanics' Associations, to be held at Saratoga Springs, commencing June 15, promise to be of unusual interest, not particularly because of the number of new subjects to be reported on by committees, but principally, perhaps, because of the unusually large attendance promised by the meetings of the two associations being held close enough together to enable many members to attend both conventions, who heretofore could find time to attend but one. This wise arrangement cannot fail to promote more cordial relations between the associations, greater interest in the meetings, and the best interests of the railroads that are represented by the membership.

The place of meeting selected will also be instrumental in drawing a large attendance, as its natural attractions are great and the hotel accommodations are unsurpassed.

Several new and important subjects will be reported on by committees, and discussed in both conventions, and those subjects that have been continued from last year's conventions will now be treated in the clearer light of the knowledge gained by another year of experience and inquiry.

In one respect great improvement can be made over past practice in the dispatch of business at the meetings of both associations, and that is by a better observance of parliamentary usages in making, amending and discussing motions. This was made very apparent during last year's conventions, and the confusion arising from the lack of proper observance of the most common rules for the action of organized bodies resulted in the stoppage of business, on one occasion at least, in each convention. Motions were made and amended, and other motions and amendments offered without proper action until nobody knew what was the question before the house.

While intimate familiarity with parliamentary rules is not necessary to conduct the work of such conventions, yet the strict observance of such rules as require that motions or questions shall be distinctly stated to the house before debate is allowed, and that the debate shall be confined to the question under discussion, will greatly facilitate the disposal of business and lighten the arduous duties of presiding officers.

OUTRAGES ON ENGLISH TRAINS.

It would seem that five more attacks during May upon unprotected women in the secluded apartments of English railway carriages would awaken the English people to the fact that their type of cars is a standing encouragement for such crimes. On May 6 some men walking along the railway near Leeds found a woman lying near the track. She was terribly injured, and was just able to say that she had been attacked in a railway carriage, and that her assailant had thrown her headlong from the train, which was running at full speed.

May 12 the Hon. Patrick Greville-Nugent, a Magistrate and Deputy Lieutenant of County Westmeath, Ireland, pleaded guilty to having attacked Miss Marion S. Price in a compartment of a railway carriage, and was sentenced to six months' imprisonment at hard labor.

On the 16th of May a painter named Windle was arrested at Retford for attacking a cook named Hannah Cordock in a railway car near Babworth. As the train approached the station he jumped from a window of the car, but was afterward captured by the police.

This was a pretty good record for one month, but as a clergyman, Goodall, had inagurated the late campaign of such assaults it remained for another clergymen, the Rev. Kennedy Bell, rector at Little Bedwyn, to cap the climax. The daughter of the station master at Kintbury while traveling May 17 was luckless enough to be put in a compartment with this wretch. He outraged her shamefully. She did not report the matter to the guards on leaving the train, and her place was immediately taken by a Miss Abery, a telegraph operator. The train had not proceded far before he outraged her also. Although both women had screamed for help they had been unable to make themselves heard above the noise of the train. The Rev. Bell is awaiting trial under heavy bonds. While such disgraceful conduct may be promptly and severely punished, it should be plainly evident that a change in the form of passenger cars to that of the American type would more effectually cure the evil.

THE MASTER CAR BUILDERS' CONVENTION.

The new and the novel will probably not be very striking features of this year's convention, as only about four of the eleven committees to report have subjects different from what came before the convention last year. But while the charm of investigation in new fields may not be anticipated to any great extent, the pleasure of doing well what has been undertaken may surely be counted on; and after all that is the best pleasure and gives promise of the surest advance. It is not the man who undertakes the most that accomplishes the most, but it is the one who undertakes only that well within his capabilities and pursues his object regardless of time or labor that in the end accomplishes lasting success. What is true of an individual is true of an association of individuals, and while there may be a question in the minds of some as to the advisability of continuing committees of investigation on any one subject year after year in succession, the position should be firmly adhered to that, while the investigation of a subject may sometimes properly be suspended for a while, no investigation should be considered as dropped, old or obsolete until the purpose for which it was undertaken has been accomplished. All of the subjects carried over from the last convention, and that are to be reported on and discussed at the coming convention, are of great interest to those responsible for the maintenance of car equipment, and of vast importance to the railroad interests of the country.

"Joint Inspection."—There are few matters that come before the Master Car Builders' Association of as great importance as the joint inspection of cars at interchange points, or of as great interest to the traffic department of the railroads represented in the Association. Celerity in the dispatch of traffic has come to depend largely upon the excellence of the systems of joint inspection adopted at different interchange points. Large expenditures for repairs, also, depend upon the intelligence and fairness of inspectors for being charged to the proper company, and it is to the interest of all that such charges should be justly placed.

The committee to report upon this subject was appointed in accordance with the recommendation of the committee on joint inspection last year, and the particular duties assigned were the forming of a set of interpretations for the use of inspectors of the Rules of Interchange from No. 3 to 10 inclusive, to define the limits to which the more common defects may exist and be considered safe to run, to classify all kinds of defects for which owners are responsible, and prepare a set of illustrations covering the principal defects met with in practice.

We have before remarked on the frequency with which inspectors, through ignorance or misunderstanding of the rules, caused their employers to become liable for expensive repairs they were in no way properly responsible for. Any plan adopted by the Association aiming to thoroughly instruct this class of employés in their duties will result in less disputes about who should pay for repairs, and fewer cases referred to the now overburdened Arbitration Committee.

"Air Brake and Signal Instructions."—An elaborate report upon this subject was presented last year by the committee on "Air Brake Standards and Inspection, and Care of Air Brakes on Freight Cars." The matter of instructing all classes of employés whose duties in any way require them to inspect, handle, or repair air brakes was thoroughly and admirably covered, but it was thought that a revision of the instructions, including some few corrections, would greatly add to their usefulness.

None of the members of the committee having the revision of the instructions in hand were connected with the committee that presented them to the Association, but it is improbable that there will be any very radical changes in the instructions as recommended by the former committee. The corrections found necessary will be made, but the scope and general tenor of the instructions will probably be unchanged. Indeed, it does not appear that there is room for any great improvement.

It is of the utmost importance to the safety of train service that all employés connected with the movement of trains, and the inspection and repair of cars and loco-

motives, should have a clear conception of the functions of the different parts of the air brake apparatus, and be thoroughly informed as regards its proper treatment and operation. It does not appear that a better plan to accomplish this desideratum can be adopted than the form of questions and answers proposed last year.

The investigations of a committee appointed to ascertain what improvements are being made in the manufacture of cast iron wheels will be reported, and will indicate what progress is being made in securing more uniformity in quality, depth of chill, and more perfect distribution of metal for proper balance. It is desirable to have all these excellencies in their highest state of perfection, and such agitation as the appointment and investigations of this committee is a very effective way of urging on improvement.

"Freight Car Truck Frames" is the subject for another committee to report upon, which is supposed to have canvassed the relative advantages of rigid and swing motion trucks, and the merits of the Fox pressed steel truck as compared with other trucks.

Judging from those mirrors of current opinion—the railroad clubs—it appears that the supposed advantages of swing motion freight car trucks have not been demonstrated in the increasing hard conditions and higher speeds of trains, and that many roads are changing back to rigid trucks for steadiness in running and economy of repairs.

It is not likely that much of interest can be reported concerning the form of pressed steel truck mentioned, as experience with it has been too limited.

"Steam Heating and Ventilation of Passenger Equipment Cars." The committee on this subject, continued from last year, will report on the general progress of steam heating, and propose a standard location for ends of train pipe and a union between hose and pipe.

In its report to the last convention this committee did not give the matter of ventilation of cars even the prominence of mention. This is a matter that very little progress has been made in for many years, and the intelligent portion of the traveling public will soon force attention to it by patronizing those roads that are, or become, enterprising enough to give their patrons pure air of comfortable temperature to breathe, and by avoiding those roads, however magnificent the cars or luxurious their fittings, where the air furnished for breath is polluted by exhalations from the lungs of people in all different stages of health and disease, and of all degrees of cleanliness.

The American passenger train of to-day is the most comfortable and magnificent means of travel on the face of the earth. Skill and money without measure or stint have been employed to make it so, and all for the convenience and comfort of the passenger, and for the attraction of patronage. Yet proper ventilation, upon which the comfort of the cleanly and intelligent passenger largely depends, receives little attention and the system of ventilation in general use stands where it did 20 years ago.

A writer, whose business frequently takes him to theatres, relates in a recent article that he has often compared the conditions of ventilation of different theatres and observed the comments of people in the audience who were unconsciously influenced by the ill or good ventilation of the houses.

The production of a drama at one theatre would be seen by large audiences, attended by enthusiasm and demonstrations of general satisfaction. When, a week later, the same company produced the same play, with the same scenery, the same effects, equally good music and under ostensibly as favorable circumstance at another theatre "the attendance would be smaller, enthusiasm less, the rush for 'cold tea' greater between the acts, and there would be dissatisfaction with the piece, the acting, the orchestra, the waits and what not, the audience exhibiting a languor, restlessness and peevishness, the causes for which were attributed to everything but the real thing, foul air. The first theatre was well ventilated, the other not."

What is true of the effects of good and bad ventilation on audiences in theatres is true of passengers in chair, parlor and sleeping cars.

Of course there are difficulties in the way, and the subject is not an easy one to approach, but it will become easier when investigation is begun.

Aside from the committee which is to report its investigations upon the relative merits of solid cast and wrought iron centers, and plate centers of steel-tired wheels, all the other committees were continued from the last convention; and as the results accomplished by several of them have so recently appeared in these columns, they are sufficiently familiar to our readers as to make further comment unnecessary.

We have space to touch but upon one—"Metal for Brake Shoes." This committee expressed such disappointment at the last convention at its inability to present a satisfactory report, and was so averse to being continued in the face of the almost certainty of being unable to accomplish anything more, that it was evident it should be relieved and the subject rest a while. As the committee was continued the result is what might almost have been predicted. It was unable to accomplish anything, and will have nothing of consequence to report.

THE MASTER MECHANICS' CONVENTION.

As most of the subjects to be reported upon by the investigating committees of the Master Mechanics' Association at its coming annual convention are new and interesting, and as a large attendance is likely, because of the nearly contiguous meetings of this and the Master Car Builders' convention, it is probable that this convention will be memorable as one of the most interesting and important in the history of the association.

The report of the committee continued from last year, with the addition of several members, on "Exhaust Pipes, Nozzles and Steam Passages" is first on the list. Much valuable information has been furnished by the experimental investigations and able reports of this committee during the last two years, and judging from the animated discussion of the subject at the last convention it is apparent that there is no lack of interest in the matter among master mechanics, all appreciating, evidently, the influence on the coal consumption of locomotives that is exerted by the details named in the subject.

"The Present Status of the Car Coupler Question." This subject comes up again to be reported on. The prospect of national legislation on the matter does not appear so threatening now as it has for the past year, but it has been sufficiently so to turn all interested in American railroads into a committee of the whole, as it were, on the "Present status of the car coupler question." So there is not much chance for the committee to present a very startling report, as nearly all interested are pretty well informed on all available information.

"Standard Tests for Locomotives." An interesting report upon this important subject may be expected, and the adoption of a standard form of tests naming all the conditions that should be observed during tests, and duly considered in reporting the results of same would be of great value. The locomotive is such a delicately adjusted arrangement of mechanism, despite the rough service it performs, that very slight changes in apparently unimportant details often largely affect its efficiency and economy. Therefore, in making comparative tests of different locomotives it is imperatively necessary, if reliable data are to be obtained, that a great many points must be considered. Very important considerations are often neglected in making such tests, causing the results to be misleading if not worthless.

In considering this matter of locomotive tests, it will be well to reflect upon the many unavoidably variable conditions of service tests, that, with the employment of all possible precautions and all available knowledge, will exert immeasurable influences. Methods of management practiced by enginemen; stops; delays; condition of the rails, wet or dry; temperature; the force and direction of the wind; state of the coal, in lumps or slack, even when from the same mine, are all uncontrollable and immeasureable influences in service tests. Yet each of the conditions named exerts considerable influence upon the performance of locomotives.

These considerations suggest the advisability of shop or laboratory tests where all disturbing conditions could be eliminated. A notable example of such an arrangement is the locomotive testing laboratory of the Purdue University at Lafayette, Ind. If such means of testing locomotives were placed at the service of the association, many important tests could be conducted that would add greatly to present knowledge, and aid in the evolution of the locomotive into a more efficient and economical engine.

"Compound Locomotives." The report of the committee on this subject will probably be the one in which the most interest will center. Elaborate tests have been conducted by the committee, and it is probable that a good report will be presented to the convention.

The auxiliary committee representing the different locomotive works may be depended upon as having taken care that the claims to merit of the different types and makes of compound locomotives received due consideration.

Compound locomotives have made rapid advance in favor and adoption during the last year, and it is not likely that anything has been developed by the investigations of the committee adverse to the reputed merits of compounding, although it is doubtful if the claims of very large percentages of saving have been substantiated by the very thorough tests made by the committee.

"Tests of Steel and Iron."—The committee on this subject was appointed primarily to investigate and report upon the critical temperature of steel. There are many interesting and important questions connected with this matter, the investigation of which will probably lead to a more intelligent use of steel, and greater safety. It was suggested at the last convention that the committee should make experiments with the different brands of steel in the market of various degrees of carbon at different temperatures. If this has been done the information will be valuable. All discussion of this subject is an educational sort of agitation that will tend toward improved methods in the manipulation of steel. It was within the scope of this committee to also investigate the behavior of iron at different temperatures, and any question relating to steel and iron that it might choose.

"Uniform Locomotive Performance Sheets."—This is one of the most difficult subjects to report satisfactorily upon in the whole range of questions affecting railway motive power. There is much difference of opinion in regard to the value of locomotive performance sheets for comparison of the performance of engines on roads in different sections of the country, even although the items and system of comparison are uniform. Differences in gradients, the number of cars hauled per train, feed water and quality of fuel are all disturbing elements in attempted comparisons of this kind. Differences of temperature also enter largely, as yet, in adding to the uncertainties. Notwithstanding these drawbacks, the establishment of a uniform system of recording the performance of locomotives would eliminate many of the present existing uncertainties of such comparisons. and would tend to improve the service.

"Boilers for High Pressure Locomotives." The committee on this subject drew the capital prize in subjects, as it is new and full of interest for every progressive master mechanic, and yet is one involving no very laborious investigations.

The higher pressures of steam coming into general use for locomotives make it highly proper that the association should devote attention to the design and construction of boilers intended to carry the higher pressures. The question is by no means a complicated one, being but one of strength, thickness and ductility of plates and judicious staying, the whole to give the requisite strength. It has been the expressed belief of some that there were elements of danger in the higher pressures, say, of 200 pounds per square inch and over, through weakening of the boiler plates due to the accompanying higher temperature. This is altogether a mistaken idea, as experiments with both iron and steel plates have shown that no weakening of either takes place below 400 degrees Fah., which is the temperature of steam of 235 pounds effective pressure per square inch, and which will probably be found to be about as high in pressure as it will be desirable to use in locomotive boilers.

Having designed and constructed a boiler to safely carry the high pressure steam the real difficulty then presents itself, and that is to impress the engineers who use the steam with the necessity of opening the throttle wide enough so as to get the benefit and utilize the higher potentiality of the steam, to get which more heat has been expended and to hold which a stronger and more expensive boiler has been constructed.

The objects of the investigation are entirely praiseworthy, and the superior economy of the highest practicable pressure beyond dispute, but the matter needs to be looked at in more ways than one.

Railroad men are frequently impressed with the curious coincidence in the nature of groups of train accidents. Among the most curious of such coincidents were the accidents occurring on the New York Central and the Pennsylvania railroads on May 1. Near midnight, and within the same hour, wrecks occurred on both these roads that threw cars upon the opposite bound tracks, and before warning signals were sent out opposite bound trains ran into the obstructions causing dreadful wrecks, that in each case took fire at once and burned the bodies of the engineers, who were instantly killed in the collisions.

The lesson taught is not that the element of great safety is lacking with separate tracks for opposite bound trains, but, simply, that greater care must be taken to prevent accidents of any kind, for it is shown how easily the first occurring accident, possibly slight in itself, may cause great disaster. Both of the primary wrecks were due to remediable causes, that on the New York Central being caused by the carelessness of an engineer, who dashed into the rear of a preceding train; and that on the Pennsylvania by a defective brakebeam or rigging. The recurrence of the former may be prevented by stricter discipline or the improved system of signals now being erected on that road, and of the latter by giving greater strength to the detail that failed, or more thorough inspection.

California robbers have quit railroading for awhile and turned their energy toward their interests in the stage business. Four stage robberies were perpetrated in that State in May. One young lady passenger and one express messenger were killed, and one driver wounded. Large amounts were stolen, in one case $20,000 being taken.

In California it is found that peach stones burn as well as the best coal, and give out more heat in proportion to weight. The stones taken out of the fruit that is tinned or dried are collected and sold at the rate of $6 a ton. Apricot stones also burn, but not so well as peach, and do not command so good a price.

The Grand Trunk Railway of Uruguay has been completed. It runs 352 miles almost due North from Montevideo to the town of Rivera on the Brazilian frontier. The immediate result of this line to Brazil will be to open up a vast tract of fertile land hitherto comparatively valueless.

The prospect is that the Engineering Congress, which is to be held in Chicago in 1893, under the auspices of the World's Congress Auxiliary, will be a gathering of very great scientific importance.

Personal.

Mr. C. F. Ward has been appointed Master Mechanic of the Duluth & Winnipeg road.

President and General Manager H. C. Cross, of the Missouri, Kansas & Texas, has resigned.

Captain John A. Grant, General Manager and Third Vice-President of the Texas Pacific, has resigned.

Mr. W. G. Pearce has been appointed Assistant General Manager of the Northern Pacific in addition to his present duties of General Purchasing Agent.

Mr. R. P. Schwerin, until recently Lieutenant of the United States Navy, has been appointed General Purchasing Agent of the Southern Pacific Company.

Mr. Willard Kells, oldest son of the late Ross Kells, Superintendent of Motive Power of the Erie, has been made foreman of the company's erecting shops at Meadville.

It is reported that Mr. James Macbeth, Superintendent of Motive Power of the Adirondack & St. Lawrence, has been appointed Acting Superintendent in addition to his other duties.

Mr. W. T. Smith, Master Mechanic of the Lexington Division of the Chesapeake & Ohio, has had his jurisdiction extended over the Big Sandy Division with headquarters at Lexington, Ky.

Mr. Thomas Aldcorn has resigned his position as Division Master Mechanic of the West Shore Railroad to accept the position of Mechanical Superintendent of the Empire Car Coupler Company, with office at 15 Warren Street, New York.

Mr. L. S. Thorne, Superintendent of Transportation of the Texas & Pacific, has been appointed General Superintendent of that road, with headquarters at Dallas, Tex., and the position of Superintendent of Transportation has been abolished.

Mr. George M. Hallstead, a son of General Manager Hallstead, of the Delaware, Lackawanna & Western, for a number of years trainmaster of that road at Scranton, has been made Treasurer and General Manager of the Buffalo Car Wheel Works.

Mr. George W. Saul, formerly President and General Manager of the Chicago & Eastern Illinois, has been elected by the new directory of the Ohio Southern road to serve that road in the same capacities. Mr. Saul's headquarters will be at Springfield, Ohio.

Mr. M. Patterson, for several years General Foreman of the Omaha shops of the Union Pacific, has been made Master Mechanic, with headquarters at Salt Lake City, succeeding Mr. A. C. Hinckley, who was lately transferred to the St. Joseph & Grand Island road.

Mr. Newman Kline, Assistant to General Manager Mellen of the Northern Pacific, has been appointed General Manager of the Seattle, Lake Shore & Eastern, recently absorbed by the Northern Pacific, to take effect June 1. His headquarters will be at Seattle, Wash.

Mr. E. S. Bowen, who has been General Manager of the Rome, Watertown & Ogdensburg since September, 1889, has resigned that position. He was formerly for five years General Superintendent and afterward Vice-President of the New York, Lake Erie & Western.

Mr. Theodore L. Woodruff, formerly President of the Central Transportation Company, and the inventor of the Woodruff sleeping cars, was struck by a train while attempting to cross the tracks at Gloucester, N. J., on May 2, and instantly killed. Mr. Woodruff was 81 years of age.

Mr. T. Jefferson Coolidge, of Boston, who has been appointed to succeed Mr. Whitelaw Reid as Envoy Extraordinary and Minister Plenipotentiary to France, is an ex-President of the Atchison, Topeka & Santa Fe and Boston & Lowell roads, and is at present a director in several railway corporations.

Mr. Charles A. Thompson, formerly Superintendent of Motive Power of the Long Island Railroad, has been appointed Superintendent of Motive Power and Rolling Equipment of the Port Reading Railroad and Mr. John G. Thomas has been appointed Assistant Superintendent of Motive Power and Rolling Equipment, both with headquarters at Jersey City, N. J.

Mr. V. E. McBee, General Superintendent of the Central of Georgia, has resigned, and it is reported that he will take a position with one of the roads on the Vanderbilt system. Mr. McBee has been General Superintendent of the Central of Georgia since its lease to the Georgia Pacific. He was formerly Superintendent of the Western North Carolina and other divisions of the Richmond & Danville.

James Goudie, Sr., the builder of the first ship that crossed the Atlantic by steam power alone, died recently at his home in Evanston, Ill., aged eighty-three. Mr. Goudie was born in Canada, engaged in shipbuilding in England during early life, and, returning to Canada, built the "Royal William," the first steamship that crossed the ocean. The "Royal William" was completed in 1833, and sailed from Quebec to Queenstown. Mr. Goudie spent the later years of his life in Evanston, Ill.

Mr. J. E. Sague, who has recently been Superintendent of Machinery of the Jamaica Railroad, Island of Jamaica, has been appointed Mechanical Engineer of the Schenectady Locomotive works, having general charge of testing department, inspection of work and erection of additions to plant in the shape of new buildings and machinery. Mr. Sague's technical education, together with his experience on railroads both in Jamaica and the United States, abundantly qualifies him for his new position.

Mr. Lewis W. Towne, for many years General Superintendent of the Kansas City, Fort Scott & Gulf, and Kansas City, Springfield & Memphis railroads, died at Kansas City, Mo., May 14, of inflammatory rheumatism, after a long and painful illness. Mr. Towne was forced to relinquish very active duties three years ago through failing health. He was a brother of A. N. Towne, General Manager of the Southern Pacific Company. He began his railroad career at the foot of the ladder and rose through the grades of locomotive engineer, master mechanic, superintendent, to general superintendent, filling the latter position on three of the large Western roads.

Mr. Erastus O. Hill, formerly Superintendent of the Western Division of the New York, Lake Erie & Western, died at Matamoras, Pa., opposite Port Jervis, on April 27, of apoplexy. Mr. Hill was born in Charlestown, N. H., in 1828, and after being employed as a mechanic in the shops of the Vermont Central and of the Cleveland & Toledo he was made Master Mechanic of the latter line. He became Master Mechanic of the Atlantic & Great Western in 1868, and of the main line of the Erie in the following year. In 1872 he was appointed Superintendent of the Rochester Division and a few months later Superintendent of the Eastern Division, a position which he occupied for several years, until his retirement in 1886.

Mr. George W. Stevens, General Manager of the Chesapeake & Ohio, has had his jurisdiction extended to cover the Elizabethtown, Lexington & Big Sandy, and the Ohio & Big Sandy railroads. Before going to the Chesapeake & Ohio Mr. Stevens was Assistant General Superintendent of the Wabash under General McNulta's receivership. He was formerly a train dispatcher on the Wabash, and although a comparatively young man, his rise in recent years has been rapid, and is a notable example of what can be achieved in American railroad service with the capital, simply, of intelligence, integrity and good judgment, and the capacity for hard work and plenty of it—all of which Mr. Stevens has shown himself to possess in an eminent degree. Every promotion he has had has been well earned by faithful work and the display of fitness for it.

Mr. Edwin M. Herr, Master Mechanic of the Chicago Division of the Chicago, Milwaukee & St. Paul, has been appointed General Superintendent of the Grant Locomotive Works, Chicago, commencing June 1.

Mr. Herr began his railroad career as a telegraph operator on the Kansas Pacific. He is a graduate of the Yale Scientific School. He has seen service as a workman in the Pennsylvania Railroad shops at Altoona; as special apprentice in the Chicago, Milwaukee & St. Paul shops at West Milwaukee; and as draftsman, Engineer of Tests, Superintendent of Telegraph and Division Superintendent on the Chicago, Burlington & Quincy. He was called to the Chicago, Milwaukee & St. Paul in 1890 as Master Mechanic of the Chicago Division. While yet a young man, being 33 years of age, he is excellently qualified by education and experience for the responsible position he assumes.

Not long ago, says the Indianapolis *News*, a man put his valise on a baggage truck at an Indianapolis, Decatur & Western station while he went to buy a ticket, and when he returned the valise was gone. Some one had stolen it. According to the rules of the company Superintendent Boyd told him to make an itemized statement of the contents of the valise, and this was done. That statement was, in the language of Mr. Boyd, "a daisy." Cuff buttons worth $12 a pair, collar buttons at $4 each, and among other things a suit of clothes that he said his wife had sent him from New York, and which he had never worn. The entire bill was for $140, and though the company believed it was being imposed upon, the account was sworn to, and it was "in" for the payment.

Mr. Boyd delayed matters as long as possible in hopes of some clew, and he thinks it lucky that he did. One day the valise was found in a ravine near the station, where it had been thrown by the thieves, and an examination of its contents was made. It is said the cuff buttons listed at $12 could be bought anywhere for 50 cents a pair. The $4 collar buttons were common bone affairs that sell at "two for five," and the new suit of clothes was not there at all. Instead was a letter written by the man's wife, in which she regretted that she could not send him his new suit because the tailor had not finished it, but she would send it in ten days, which would be three days later than the date on which the valise and its contents was stolen. The total value of the valise and its contents was about $6. As the loser had sworn to the $140 statement, he did not press any further his claim against the company when he learned that the valise and its contents had been recovered.

Literary Notes.

A Treatise on Steam Boiler Incrustation, and Methods for Preventing Corrosion and the Formation of Scale. By Charles Thomas Davis. Illustrated by sixty-five engravings. 140 pages. Price $1.50. Henry Carey Baird & Co., Philadelphia.

The author describes very clearly the effects of rain, river, well and sea waters on steam boilers, and several kinds of compounds and apparatus for purifying, softening and heating such waters.

The subject is treated in a plain practical manner and much information of value is given.

A Manual of the Steam Engine. Part I. Design, construction and operation. For engineers and technical schools (advanced courses). By Robert H. Thurston, A. M., LL.D., Dr. Eng'g, Director of Sibley College, Cornell University, etc. New York, John Wiley & Sons, 1891. Cloth, 934 pp. Price, $7.50.

This work is in two volumes. It gives in a condensed but clear and forcible form the essential facts and principles constituting the theory of the steam engine, and also the more important facts in regard to its history and structure. The following are the main points upon which this volume treats: History of the steam engine; Structure of modern engines; Philosophy of the steam engine; Thermodynamics of gases and vapors; Theory of the steam engine; Compounding, jacketing and superheating; Efficiencies of the steam engine.

This broad and interesting field is so thoroughly covered and so entertainingly treated that it will be a much prized addition to the library of any one interested in steam engines of any description. The book is well bound, excellently printed on good paper, fully illustrated and carefully indexed.

Books Received.

State Railroad Commissions, and How they May be Made Effective. By Frederick C. Clark, Ph. D. Instructor in History and Political Economy, Ann Arbor High School,

Timber Physics. Part I. Preliminary Report of Forestry Division, U. S. Department of Agriculture. Compiled by B. E. Fernow, Chief of Forestry Divisiion.

Bulletin No. 33. Bureau of the Amrican Republics. Descriptive of the Republic of Colombia.

Economies in Maintenanec of Way. By Benjamin Reece, M. A. Soc. C. E. Furnished on application by the Q. & C Co., Phenix Building, Chicago.

This is a pamphlet giving in bound form a paper read upon the subject of its title at a recent meeting of the New York Railroad Club, mention of which was made in the columns of the April NATIONAL CAR AND LOCOMOTIVE BUILDER.

Berthel's Business Directory of South America, Central America Mexico, Cuba and West Indies. By Jules Berthel. 112 N. Charles Street, Baltimore.

This book will soon be issued, and will contain the names of merchants, importers, etc., in the above named countries. We will give further notice of it when it appears.

A terrible hurricane passed over New Zealand, May 16 resulting in heavy loss of life and destruction of railroad, shipping and other property.

The quantity of coal imported into Spain last year was 1,615,253 tons. The corresponding importation in 1890 was 1,431,693 tons; and in 1889 1,335,009 tons.

A favorable report has been obtained on the bill appropriating $40,000 for the survey of a route for a ship canal to connect Lake Erie, at or near Erie, with the Ohio River, at or near Pittsburgh. If constructed this canal would open up to Northwestern Pennsylvania a very large waterway reaching to the Gulf of Mexico. For many years after the construction of railroads was begun little attention was given to canals, many of those already constructed fell into the hands of railroad companies and were abandoned. Attention has recently been directed anew to the value of such waterways, and now that the country has been well supplied with railroads, there is a disposition to renew the construction of canals as furnishing a cheaper means of carrying certain bulky products and because they act as regulators of railroad rates during the season of navigation.

Captain Mitchell, better known on the road as "Old Mitch," is probably the oldest sleeping-car porter, in point of years and service, there is on the road. He is nearly 68 years old, and has been in the Pullman service seventeen years. His run at present is on the Rock Island from Chicago to Denver and return. He owes his length of service in part to the late Tom Potter, one of the most popular railroad men in the country when living. Mr. Potter had occasion once to ride in Mitch's sleeper, and being unable to sleep, he went to the smoking-room where Mitch was, and a conversation followed. Potter liked Mitchell, made some inquiries regarding his faithfulness and competency, and then took occasion to do what most men would have forgotten or neglected—he said a good word for Mitch at the right time and in the right place, and when Mitch was not out of a job; and the result was that Mitch, having the right sort of backing, in connection with his ability to fill the job, will probably die in harness.—*Chicago Tribune.*

A Ten-Wheel Passenger Engine.

The accompanying illustration is from a photograph of a 10-wheel passenger locomotive built by the Schenectady Locomotive Works for the Chicago, St. Paul, Minneapolis & Omaha Railroad. The engine has no particularly special features, but it is an excellent example of the latest practice in the building of this class of locomotive.

The boiler is of steel, and is of the wagon-top pattern, the barrel being 56 inches in diameter. The horizontal seams are quadruple riveted, with a welt strip inside. The circumference seams are double-riveted. The firebox is of steel and is $90\frac{1}{8} \times 40\frac{1}{4}$ inches inside, the depth being $57\frac{1}{2}$ inches at the front end and $54\frac{1}{2}$ inches at the back. The crown-sheet is stayed by crown bars. There are 240 tubes 2 inches in diameter and 12 ft. long. The heating surface is: Firebox, 126.3 square feet; tubes. 1,497.5 square feet; total, 1,623.8 square feet. The grate surface is 25.5 square feet. The smoke-stack is 16 in. inside diameter, and the top is 15 feet above the rail. The boiler is supplied by two Monitor injectors placed on the right and left sides of the boiler. The boiler is to carry a working pressure of steam of 170 pounds.

The driving-wheels are 64 inches in diameter. The driving-axle journals are $7\frac{1}{2} \times 8\frac{1}{2}$ inches. The engine truck is of the usual pattern, with 30-inch wheels, the axle journals being 5×9 inches. The driving-wheel base is 11 feet 6 inches; the total wheel-base, 21 feet 7 inches. The tires of the forward driver are plain, so that the total rigid wheel-base is but 5 feet 11 inches.

The cylinders are 18 inches in diameter and 24-inch stroke. The piston packing is cast-iron rings, and the Jerome metallic packing is used in the piston-rod and valve-stem stuffing boxes. The steam ports are 16×1 inches, and the exhaust ports 16×3 inches. The valves are the Allen-Richardson balanced valve; they have $\frac{7}{8}$-inch outside lap and $\frac{1}{32}$-inch inside lap. The greatest travel of the valve is $5\frac{1}{2}$ inches, and the lead in full stroke $\frac{1}{16}$-inch.

The tender is carried on two four-wheeled trucks of the Schenectady standard pattern, having channel iron bolsters, center bearings front and back, with side bearings on the back truck. The tender wheels are 33 inches in diameter and the axle bearings $4\frac{1}{2} \times 8$ inches. The tender frame is of iron. The tank has a capacity of 3,300 gallons of water, and $5\frac{1}{2}$ tons of coal are carried in the coal pit.

The total length of the engine and tender is 54 feet $5\frac{1}{4}$ inches, and the total weight of the locomotive in working order is 116,000 pounds, of which 91,000 pounds are carried on the driving wheels.

A SCHENECTADY TEN-WHEEL PASSENGER ENGINE.

The Coal Burning Period.*

A very large part of the boasted advance of civilization is merely the acquisition of an increased capability of squandering. For what are we doing every day but devising fresh appliances to exhaust with ever greater rapidity the hoard of coal? There are just a certain number of tons of coal lying in the earth, and when these are gone there can be no more forthcoming. There is no manufacture of coal in progress at the present time. The useful mineral was the product of a very singular period in the earth's history, the like of which has not again occurred in any noteworthy degree in the geological ages which have since run their course. Our steam engines are methods of spending this hoard, and what we often hear lauded as some triumph in human progress is merely the development of some fresh departure in a frightful extravagance. We would justly regard a man as guilty of expending his substance wastefully if he could not perform a journey without a coach-and-six and half a dozen outriders, and yet we insist that the great steamers which take us across the Atlantic shall be run at a speed which requires engines, let us say, of 12,000 horse power. If the number of passengers on such a vessel be set down as 500, we have for each passenger the united force of 24 horses, night and day, throughout the voyage. I expect our descendants will think that our coal cellars have been emptied in a very wasteful manner, particularly when they reflect that if we had been content with a speed somewhat less than that at present demanded the necessary consumption of coal would have been reduced in a far greater proportion than the mere alteration of speed would imply. Doubtless the end of the coal, at least as an article of a mighty commerce, will arrive within a period brief in comparison with the ages of human existence. In the history of humanity from first to last the few centuries through which we are now passing will stand out prominently as the coal-burning period.

* Sir Robert Ball in *Fortnightly Review.*

The annual report of the Southern Pacific Company for 1891 shows gross earnings of $50,450,000, an increase of $2,097,000 over the previous year. The operating expenses were $31,164,000, the net earnings $19,850,000, an increase of $2,143,000 over 1890. The total passenger earnings were $13,051,000, an increase of $890,000. The freight earnings were $33,675,000, an increase of $1,535,000.

The first of the World's Fair buildings to be finished was the Mines and Mining Building, completed May 15.

A Relic.

As showing the early prejudice against the use of steam of even moderate pressures above the atmosphere, we resuscitate the following communication which appeared in an English paper in 1850. Pressures exceeding fourfold that complained against are not uncommon now.

"The late fatal accident at Bristol to a high-pressure boat should not be passed over without some practical suggestions that may prevent its repetition. It is clear that most of the unhappy people that were thrust into eternity on that occasion were ignorant of the character of the vessel they were embarking in. From some twenty-five years' acquaintance and connection with steam navigation, I am sure that not one passenger in twenty in this country would put his foot on board a steamer if he had an idea she was worked with high-pressure steam; and I would suggest that the Board of Trade (who have ample power) should make it compulsory on all passenger steamers to have the pressure per square inch on the safety valve painted in legible characters 9 or 10 inches long on the paddle box, so that her Majesty's subjects might know before they paid the fare what sort of a craft they were going on board of.

"I was formerly of opinion that the engineer who made a high-pressure engine for marine purposes should be tied down by legislative enactment to work it; knowing that such a regulation would be equivalent to a prohibition. But experience has shown me the inutility of legislative prohibition; that all we can do is to warn people, just as we license a cab to carry two, an omnibus twelve in and fifteen out, or *vice versa*, and after that if any obstinate fool choose to risk being blown up in the *Cricket*, with 50 lbs. pressure, while he can go as fast in the *Fly* with five—why, her majesty may have lost a subject, but not a valuable one.

"LONDON, Aug. 12, 1850."

Draft Gears for Freight Cars.

(*Continued from page* 91.)

directly on the subsill, which is protected by metal for the purpose, and in pulling the strains are taken by the draft sills before the spring is closed Hence, with this arrangement, the spring is relieved from the blows of buffing and the shocks of uneven draft, evidently a most desirable result, and one which contrasts strongly with those constructions which permit the blows to be received by the draft springs after they are closed up. A continuous draft gear is also the result of using a steel center sill, as in the Harvey and Westinghouse types. In these designs the steel center sills provide a continuous drawbar and a continuous buffer with a minimum number of parts.

There are some designs, such as the Lake Shore, Figs. 28, 29, 30 and 31, which are, in fact, continuous buffers—that is, the buffing blows are transmitted from end to end of the car by means of a sub-sill, which is provided below the center sill. A sub-sill is now common. The result of its use is the strengthening of the draft attachment and an increase in the weight and cost of the car. It is not of great value where a proper buffer stop is provided on the coupler, for the reason that if the draft rigging is put up as it should be, the buffer stop on the coupler will transmit the blows directly to the center sills, which are manifestly strong enough to withstand any reasonable buffing.

In closing this short review of the various types of draft rigging now used, it seems but proper to point out what will probably be the ultimate result of so much invention and multiplicity of parts. The increase in cost and weight of draft rigging will go on until the expense is somewhat greater than the cost of metal center sills; then steel will be used, as it should be, to replace the already inadequate wood, then a continuous draft gear and a continuous buffer stop will be provided without complication in such a way as to give to freight cars a greatly increased durability. This time is near at hand, as the price of steel channels is now about $40 per ton, and it is considerably cheaper to put steel center sills in freight cars than to meet the expense of some of the stronger and more desirable types of draft gear for wooden sills now used. However, it is not to be understood from this that a steel center sill will render it desirable to attach the draft rigging directly to the sills with such security as to permit that rigging to resist the buffing blows. Ultimately it is evident that the pulling strains will be taken up by the draft gear, but the buffing blows must be resisted by the buffer stops on the drawhead striking against some form of wooden buffer, as wood is the cheapest practical absorbent for blows that is known in the mechanical arts.

The number of live hogs shipped to New York from Western points amounted last year in round numbers to 2,000,000 head, and the traffic has become so important that some of the railroads are making extra efforts to obtain it.

Two tramps, walking along the "Big Four" track two miles east of Dayton, O., May 23, discovered a broken rail. One hurried east and the other west to signal trains. A westbound express was signaled and no doubt an accident averted. The passengers raised a purse of $100 for the men.

On May 20 a westbound freight train on the Chicago, Milwaukee & St. Paul, while running at a high rate speed, ran into a work train that was standing on a side track near Preston, Ia. A press dispatch says: "The engines came together with terrific force and both boilers exploded, fragments being thrown several hundred feet. Fifteen cars were demolished, one corner of the depot was torn off and the entire building shoved six inches to one side. The total damage was over $40,000." We have no definite information as to the explosion of the boilers. In case of rupture, of course, one or both might have exploded.

On May 12 a passenger train on the Hoosac Tunnel & Wilmington ran into a 20-ton rock that obstructed the track. The press dispatches report that the boiler exploded, but the Superintendent denies the report.

Communications.

Standardize Car Details.

Editor National Car and Locomotive Builder:

There is yet much work for the M. C. B. Association to do, looking toward the best methods of standardizing the several parts of freight cars that have not as yet been settled upon.

It does not seem wise to adopt a standard freight car throughout, at one time, without considering separately each particular part; so it seems important that more of the parts should be taken up for consideration with a view of adopting the best.

In this age of learning and wisdom, many good plans are devised and many good cars are being built, all of which are pronounced model cars by their owners or builders; and yet very few builders are enough alike in their views to assist in reducing the great diversity of parts, which is very necessary in order to facilitate repairs and keep cars moving. Many may agree in a general way as to car construction, but when details are considered there are different opinions.

If the dimensions of car framing could be fixed so that saw mill men could anticipate what would be wanted for cars, they would be enabled thereby to keep a stock of fairly dry lumber on hand instead of cutting a green tree one day to build a car with the next.

The railroads that build their own cars are better prepared to carry in stock such sizes for car framing as they use than the contract builders, who, when they get orders from different parties for cars, begin to locate their orders for lumber, and then build the cars as fast as the lumber is received. As a natural consequence considerable shrinkage takes place, causing loose bolts, bracing and leaky roofs.

It seems very necessary to have standard sizes of lumber for 40,000 and 60,000 pounds capacity freight cars, and then the length, width and height could be better considered with a view of adopting a standard car all round.

Very little seems to have been done toward adopting a standard car door and hanger. Quite a number of car doors are being lost for want of a suitable device to hold them on the car, and in making repairs there is more or less delay because of the many different sizes of doors and kinds of attachments.

Following along this line of thought, the car roof suggests itself for a place among the standards, and there are several good roofs in the market to select from. The first cost of a roof, or any other part of a car for that matter, is generally looked upon with much more concern than the cost of maintenance, but care should be exercised in whatever is selected in order to reduce to a minimum the cost of repairs.

A car recognized as standard throughout will doubtless find its way into general service ere long.

MASTER CAR BUILDER.

Breakage of Steel Tired Wheels on German Railroads.

Editor National Car and Locomotive Builder:

In a letter from Mr. Charles J. Harrah, President of the Midvale Steel Company, published in your February number, he referred to the Statement of Breakage of Steel Tired Wheels on German Railroads [see page 7 NATIONAL CAR AND LOCOMOTIVE BUILDER for January, 1892], and expressed the wish for more detailed information concerning the failures recited and their specific causes. It has taken some little time to secure this information, but I inclose it herewith. The information desired by Mr. Harrah is set forth in full detail, each cause with each kind of tire, and will give to those interested some valuable data.

It would appear that out of an average number of one million steel tired wheels in use from 1884 to 1889 inclusive, there were 20,608 breakages. That about one-half the tires were Bessemer, out of which there were 9,119 breakages That the average percentage of breakages was two per cent., and that the "Martin" tire breakages averaged about one per cent.

Mr. Harrah states that "the traveling public of the United States are to be congratulated on the fact that no such showing of broken tires has even been made on American railroads."

I have no doubt that if it were possible to obtain similar statistics covering actual results on American railroads the showing would be no better. In a statement lately received by me showing mileage on an American road of a given number of steel tired wheels of each of five leading makes, one half of the total number were ultimately removed from service on account of breakage and fracture of some kind in the tires. The statement was drawn with no reference to this question, but solely with reference to mileage, and it is not likely that it was a particular case in this respect. At all events, the fact that 50 per cent. of five different makes were ultimately removed for this cause is interesting to note.

It is not possible to obtain any such statistics for American railroad practice. They are not public property like the German railroads, and are not publishing their failures for public information.

Permit me to thank you for the courtesy extended in the use of your valuable space for this discussion, and to express the hope that a little light has been thrown on the injustice of holding every maker of chilled wheels responsible for the results obtained from the wheels of every other maker.

I note that Mr. Harrah very justly disclaims any responsibility or results obtained from Bessemer tires; or in other words, declines to be held responsible for such results simply because they were obtained from steel tired wheels. There is no more reason for speaking of chilled wheels as a type in this respect than there would be for doing so with steel wheels. I do not advocate chilled wheels simply because we manufacture them. If any other type of wheel was a better one we would make it. We make chilled wheels and advocate them for safety and economy because we have a record equal, for instance, to that of the German State railroads as to number of wheels in use with absolutely no instance of breakage.

Respectfully yours,

P. H. GRIFFIN,

President New York Car Wheel Works, Buffalo N. Y.

STEEL TIRES ON GERMAN RAILWAYS BROKEN IN CONSEQUENCE OF BRITTLENESS OF MATERIAL, IN YEARS 1884 TO 1889, INCLUSIVE.

Year.	Cast steel.		Fusion do.		Martin do.		Mangan. do.		Bessemer do.		Other steel.		Puddle do.		Tot'l No. brok'n.	Per cent. of all in use.
	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.		
1884	45	0.005	25	0.003	10	0.001	.....	.....	140	0.015	.....	.....	21	0.002	241	0.025
1885	64	0.007	39	0.004	8	0.0009	.....	.....	187	0.02	.....	.....	22	0.002	320	0.033
1886	47	0.005	38	0.004	12	0.0012	.....	.....	228	0.023	4	0.0004	22	0.002	351	0.036
1887	77	0.0076	34	0.0033	14	0.0014	1	0.0001	270	0.026	2	0.0002	24	0.0023	422	0.041
1888	99	0.009	61	0.006	29	0.003	1	0.0001	463	0.044	.....	.....	29	0.0028	682	0.065
1889	60	0.0054	48	0.0043	28	0.0025	.....	.....	492	0.045	9	0.0008	54	0.005	691	0.063

BROKEN IN CONSEQUENCE OF THE EFFECT OF BRAKES, TEMPERATURE, COLLISIONS, OLD FRACTURES, ETC.

Year.	Cast steel.		Fusion do.		Martin do.		Mangan. do.		Bessemer do.		Other steel.		Puddle do.		Total number broken.	Percentage of all in use.
	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.		
1884	135	0.014	186	0.02	25	0.0027	.....	.....	415	0 044	.....	.....	241	0.026	1,002	0.1
1885	237	0.025	318	0.033	84	0.009	5	0.0005	693	0.072	14	0.0014	196	0.011	1,457	0.15
1886	173	0.018	318	0.032	132	0.013	.....	.....	1,167	0.118	18	0.0018	153	0.016	1,961	0.2
1887	133	0.0133	152	0.0152	118	0.0118	12	0.0012	841	0.0841	16	0.0016	64	0.0064	1,336	0.13
1888	137	0.013	225	0.021	157	0.015	15	0.0014	1,199	0.115	61	0.0059	105	0.01	1,899	0.18
1889	3	0.0003	157	0 014	138	0.012	.....	.....	1,131	0.103	42	0.004	115	0.0105	1,586	0.144

BROKEN IN CONSEQUENCE OF DEFECTIVE MATERIAL.

Year.	Cast steel.		Fusion do.		Martin do.		Mangan. do.		Bessemer do.		Other steel.		Puddle do.		Tot'l No. brok'n.	Per cent. of all in use.
	No.	Per cent. of all in use.	No.	Per cent of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.		
1884	76	0.008	86	0.009	17	0.002	.....	.....	264	0.03	.....	.....	941	0.1	1,384	0.15
1885	69	0.007	107	0.011	15	0.0015	1	0.0001	319	0.033	2	0.0002	1,132	0.118	1,645	0.17
1886	74	0.0075	144	0.015	33	0.0033	.....	.....	363	0.037	10	0.001	917	0.093	1,541	0.15
1887	57	0.0057	118	0.0118	37	0.0037	4	0.0004	280	0.028	9	0.0009	638	0.0638	1,143	0.11
1888	112	0.011	94	0.009	53	0.005	2	0.0002	331	0.031	7	0.0007	642	0.061	1,241	0.12
1889	111	0.01	106	0.0097	75	0.007	.....	.....	284	0.026	14	0.0013	489	0.044	1,079	0.1

BROKEN IN CONSEQUENCE OF DEFECTIVE WELDING.

Year.	Cast steel.		Fusion do.		Martin do.		Mangan. do.		Bessemer do.		Other steel.		Puddle do.		Total No. broken.	Percentage of all in use.
	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.	No.	Per cent. of all in use.		
1884	3	0.0004	1	0.0001	.....	.....	.....	.....	15	0.0016	.....	.....	207	0.022	226	0.024
1885	.....	.....	.....	.....	.....	.....	.....	.....	9	0.0009	.....	.....	118	0.012	127	0.013
1886	.....	.....	.....	.....	.....	.....	.....	.....	13	0.001	.....	.....	122	0.013	135	0.014
1887	.....	.....	.....	.....	.....	.....	.....	.....	8	0.0008	1	0.0001	54	0.0054	63	0.006
1888	.....	.....	.....	.....	2	0.0002	.....	.....	5	0.0008	.....	.....	45	0.0043	52	0 005
1889	.....	.....	.....	.....	.....	.....	.....	.....	2	0.0002	.....	.....	22	0.002	24	0.002

Passenger Car Head Linings.

Editor National Car and Locomotive Builder:

I notice in your last issue an article on "Passenger Car Head Linings," by Mr. Robert McKeon. Much that Mr. McKeon says is undoubtedly true and there is no question but that a canvas head lining is cheaper and more durable than a veneered lining. On the other hand there is also no question but what the wood lining is much handsomer. This last fact is what tells. To my knowledge there have been no cars built during the last 10 or 12 years (excepting P, R. R. cars) with a canvas lining. The trouble with the wood lining is that after, say, six or eight years the veneer blisters in places, but this as a rule is readily repaired, and in my opinion is due to the presence of too much glue, which shrinks and cracks. Of course a bad leak in the roof will also cause blisters, but in my experience very few such instances have come to my notice, and I should say that the lining suffers more from heat than moisture. On the whole, I consider a veneered lining very satisfactory.

Mr. McKeon states that it has to be scraped every four years. I am familiar with a lot of cars having veneered head linings that were built between 1882 and 1884, and only one of these linings blistered so bad that it had to be removed, and that principally to obtain pieces to repair wrecked cars with; the other linings are all in good condition to-day, and none of them have been scraped, and the original ornamentation and finish is still good. Of course they have been revarnished about once every three or four years, but not any oftener than the other woodwork of the car. Most railway painters and car builders who are opposed to the wood linings are so because they have, unless the road is a large one, no facilities for manufacturing it, and Mr. McKeon seems to base his opinion on the experience on his own road. As he has only two such ceilings, I do not think that this is fair, as they may have been badly made. A veneered lining made of well seasoned timber, and in a workmanlike manner, will give fair service and good satisfaction.

M. C. B.

Why Staybolts Break in Service.

Editor National Car and Locomotive Builder:

As you deemed it proper to admit my letters on the subject of broken staybolts, I am induced to make you another communication.

Staybolts break in service because they are not put in within the proper distance, size, and tightness.

The correctness of this cannot be truthfully denied, notwithstanding that your Denmark correspondent terms it an absurdity. There are other causes of breakage—such as not keeping the boiler clean and letting the water run too low.

In the common practice of the present the staybolts are put in too small, and screwed in too loose, leaving the ends to be riveted to make them water and steam tight. (This is the chief cause of breakage.) It ought to be apparent that the most effective way to break or shear the tenacity of the staybolt is to rivet or upset the ends. This bad practice may be likened to that of the man who loaded on the back of his horse the grist in one end of the bag and stone in the other end, to balance it. The consequence of this is, that the boilers are subjected to strains which should be avoided, and this is done before they are put into service.

In addition to this, there is another matter inseparable from the old practice. It is that the riveting impinges, or pulls, inward the sides of the firebox. It will be readily seen that the outer and inner sheets of the firebox are, and must be, in a strained condition, and are constantly pulling against each other or in opposite directions, resulting in cracks from one staybolt to another. Here are undoubtedly the metes and bounds of this important question of mechanics.

A passing word to your correspondent: I regret to be compelled to say that I am not much disappointed by the way in which my communications have been met; not by

arguments, but by vulgar abuse, which is the only and powerful weapon of your correspondent.

A specimen of his mechanical training and logical abilities now lies before us, and of this we are sure that he does not understand our meaning, or his own meaning; and the various parts of his argument, if the name of argument can be so misapplied, directly contradict each other. To reason with such a creature is like talking to a deaf man, who catches at a stray word, makes answer beside the mark, and is led further and further into error by every attempt to explain.

His eagerness to have this question smothered resembles that of an English judge who wished to decide a case after hearing only one party, and when he had at last been compelled to listen to the statement of the defendent, flew into a passion and exclaimed: "There now, Sir! see what you have done. The case was quite clear a minute ago and you must come and puzzle it." Here we have the example of your correspondent, who shuffles and creeps about to secure an opening to escape at. And though this quibbling is but a poor employment for a grown man, still we think that it is a kind which may be turned to purposes that ought to receive no quarter. Nobody has any very strong interests in crying down noisy, pushing, elbowing pretenders, as everybody well knows they will never make good the claims that they are puffing in language too high flown for even the merits of Don Quixote. But though we have no apprehension that such puffing can confer character and reputation that is permanent, we still think its influence most pernicious.

Ignorant as your correspondent shows himself to be, he knows enough to hate us, and we persuade ourselves that had he known us better he would have hated us more.

As we know that our efforts in defending the locomotive engineers of the United States are of aversion to his kind, we, therefore, like his invections against us much better than anything else that he has written and dwell on them with a feeling akin to gratitude.

In closing will state that your correspondent misquoted my communications. J. T. CONNELLY.

Attaching Side and End Doors.

Editor National Car and Locomotive Builder:

The frequent loss of side and end doors from freight cars is a matter that should call forth more attention with an effort to have greater security and uniformity of design in this particular part of car equipment than has heretofore existed. Car inspectors cannot examine the doors of a car in a satisfactory manner when it is loaded and sealed, but must take it for granted that as the doors are in position they are secure; whereas they may be supported only by the hasps and locks, and when opened at destination the defects are discovered, but too late to save the company into whose hands such cars have passed the expense of making the necessary repairs, which might have been avoided if proper inspection had been given doors when the car was empty, at which time they could have been opened and closed.

Some roads prefer a car door supported at the bottom with a guide at the top, and others prefer a door suspended with hangers from the top and guide irons at the bottom. The latter is the proper way to apply a freight car door. A majority of the car doors that have been lost doubtless were supported only at the bottom, and such will be the case while they are applied in this manner unless more care is taken of the bottom tracks, or doorways that hold up the doors, at places where cars are loaded and unloaded.

The loss of a side door means $5 to be paid by the company losing it, and yet the actual value of the door lost is frequently not more than about half the price prescribed by the M. C. B. rules for a lost side door, making a difference sufficient to provide the door with a suitable hanging device.

A car door of standard dimensions and manner of construction, with a good hanging device attached to same and securely fastened with bolts, should be adopted by the M. C. B. Association. J. D.

Editor National Car and Locomotive Builder:

So much has been said and written about New England in various railroad journals criticising its antiquated methods and slurring its railroad management for being behind the times, etc., that after quite a long trip to the West, where everything is supposed to be of the best and most approved pattern, I am inclined to state some things which came under my own observation. Of course when a road is new and equipped with new machinery and cars it would be inexcusable if the best of everything was not applied, but as we are well aware that the life of a passenger car is upward of 30 years it would hardly be wise management to throw away all of your equipment every time the Pullman Company got out a new design, and the same is in a measure true of locomotives. One might as well throw away his house because it was not as tall as Chicago's "Masonic Temple," or because it did not conform to the new ideas of some aspiring architect who would like to give you a "Queen Anne" or an "Old Colonial" palace. I found few tracks on my trip equal to many in Massachusetts and the other New England States nor were the cars as clean or comfortable in most respects, although most of them were modern and very highly ornamented. The question of automatic car couplers I find is agitating the minds of a good many bright men at the West, and although all will, doubtless, eventually come to it as have our friends Messrs. Adams and Lauder, still they have found it expensive so far.

In all my travels I failed to find any cars that rode with anything like the smoothness of those on the B. & A. road fitted with the "Jewett adjuster," which seem to go around curves as smoothly as on a straight track, and this must greatly save the flanges and rails as well as decrease the resistance of the train. I am informed that the B. & A. people are fitting all of their coaches with the device, and have commenced also on their freight cars. This certainly should be a credit to Mr. Adams, and fully offset any charge against him of conservatism in not at once adopting M. C. B. couplers. I could relate of some interesting details of rolling stock of the Pennsylvania Railroad, New York Central, Lake Shore, Michigan Central and other roads, but they are no better than most of our Northeastern roads, and in a comparison of rolling stock do not stand as high; in other words, have been built too long. As I did not set out to give a history of my trip, nor to specify any companies in particular, I will end by saying that very few things in this world are yet perfect, but many are improving, especially railroads.

A NEW ENGLANDER.

Extravagant Fuel Consumption.

Editor National Car and Locomotive Builder:

In your issue of January I read an article on "Extravagant Fuel Consumption" which explained excellently the manner in which many so called "first class" locomotive engineers handle their engines. There are many "Hank Blanks" in the service of railroad companies and I think the very fact of their being located in the front rank will indirectly account for the extravagant waste of fuel practiced on their engines. Young engineers who have but recently vacated the other side carry with them a vivid recollection of the extra amount of work entailed by them to furnish the "Hank Blanks" with steam. They are also subjected to a stricter supervision and are not permitted to exercise the same familiarity with the foreman as the old engineer, who after indulging in some twaddle about imaginary troubles will mount the footplate and put through many hundred weights more coal than necessary. "Hank Blank," though, is generally very careful to pull his lever into the one notch from center position, whenever a boss gets aboard, and I am surprised that this one did not exhibit similar wisdom. If some system of inspection was introduced whereby a check could be maintained on the handling of engines under steam a marked saving in fuel would be affected.

While writing on the subject of fuel consumption, I think it worth while to mention that when firing some years ago on an engine equipped with sliding doors, perforated with half inch holes, I found that by leaving the doors ajar to the extent of say a half inch or more, so as to allow a thin horizontal sheet of air to enter the firebox, very little smoke was emitted and the steaming of the engine was unimpaired, but the coal consumption sheet showed a higher rate for the three months which I devoted te the experiment. I may say this tallied with my own observations in practice. With a slightly reduced opening I found that, although a little more smoke was made, there was a marked increase of economy. Some time afterward the sliding doors were discarded and swing doors on the American principle introduced, and no doubt exists in my mind that the swing door is not near so efficient as a smoke consumer, nor yet so economical. It seems to me that the perforations, being in a thick cluster at the center of the door, deliver a cylindrical body of air in a form ill-adapted for mixture, but well adapted for reducing the temperature of the firebox and gases.

J. CAMPBELL.
New Zealand Railways.

Brooklyn is a city of 900,000 inhabitants, without a custom house, though situated on the greatest harbor of America, and without a trunk railroad, though having extensive commercial and manufacturing interests. It has no parallel among the cities of the world. The position of Brooklyn and New York, side by side, is extremely interesting—the one completely supplementing the other. Of all cities in the world, New York needs just the kind of outlet that Brooklyn affords, and of all cities in the world Brooklyn requires that which New York can furnish. A union of interests between them, with a great enlargement of means of communication, would be enormously helpful to both.

The Middlesex Valley Railroad Company was incorporated in New York State May 11 with a capital of $500,000, to construct and operate a steam single track railroad about 23 miles long, from Academy street, Naples, to Geneva.

The ingenuity of the American people is shown from the fact that fully three-fourths of the entire manufacturing capital of the country, or $6,000,000,000, is based upon patents.

The Union Pacific is overhauling all its narrow gauge passenger equipment to meet the expected requirements of the coming tourist season.

To Cure Smoking Locomotives.

The Secretary of the Chicago Society for the Prevention of Smoke has addressed the following letter to the general managers of all railroads centering in Chicago:

CHICAGO, April 30.—General Manager, Dear Sir: The Society for the Prevention of Smoke during the last two months in connection with its other work has been making some tests of various devices for the suppression of the smoke nuisance as caused by locomotive engines. We thought it absolutely necessary that before approaching the railroads on the subject of the smoke nuisance we should place ourselves in a position to suggest to them the proper remedy. We feel that we are now in such position. We recommend to you any one of the four devices which follow, and we have arranged them in the order of our own preference:

(a) The Lape or Barnes device, now in use pretty generally upon the Wabash Railroad. This device can be procured through C. F. Lape, Master Mechanic of the Wabash Railroad, Springfield, Ill.

(b) The Western Smoke Preventer, which is in use upon the Chicago, Burlington and Quincy Railroad and elsewhere. This device can be procured from the Western Smoke Preventer Company, Stock Exchange Building, Chicago.

c) The Nutting device in use upon the Illinois Central Railroad and elsewhere. This device can be procured of J. C. Nutting, Phenix Building, Chicago.

(d) The Walker device in use upon the Chicago, Milwaukee and St. Paul Railroad and elsewhere. This device can be procured of H. R. Walker & Co., 302 Phenix Building, Chicago.

We have arranged these devices in this order because, although the last two are nearly as effective as the first two in point of smoke prevention, they are both more noisy than the first two. The first two being less noisy consequently will be less likely to be turned off by the engineer. For various reasons we regard the Hutchinson device as inferior to the other four. It is so noisy as to be very trying to the nerves of the engineer and fireman and it consequently offers them an excuse to turn it off at every available opportunity,

We are convinced, also, that the Hutchinson device is practically not as effective in suppressing smoke as any of the other four, but if it is kept in operation it will greatly reduce the smoke. Yet we feel that a railroad which adopts it takes chances of being prosecuted for violation of the smoke ordinances which a road does not take which applies a device more effective and less trying to the nerves.

Having thus given you your choice of various remedies which we have seen in operation, and which practically have removed the smoke nuisance, it is right that we should outline our attitude toward you in the future. We propose to give you until Sept. 1, 1892, before we shall annoy you further. In the meantime we are at your disposal, and anything that we can do for you will be very gladly done. We think that 100 days is a reasonable time to allow you to make whatever changes are necessary upon your locomotives. After Sept. 1 we shall proceed very vigorously against all railroads which are guilty of violating the smoke ordinances of the city, and the statement on the part of the management that it has adopted any device recommended by us will not be accepted by us as a valid reason for staying prosecution. The device must not only be adopted, but it must be used, and we suggest to you that if you have not already done so, you urge among your engineers reasonable care that you may be spared prosecution because of negligence of employés, who, after being provided with a means to cure the smoke, do not utilize such means.

In order that you may be saved unnecessary expense in the way of paying for royalties, the commissions of middle men, etc., we suggest that if you cannot obtain any of the devices mentioned at slight advance upon cost prices, you place the matter in the hands of your master mechanic. Let him observe the workings of the various devices, and it will not be a matter of very great difficulty for him to arrange some device of his own which shall be cheap and which will not infringe upon any one else's rights.

In conclusion, we beg to say that while recommending the four devices which we have mentioned, we shall not find fault if you procure and operate any other device which, when operated, effectively removes the smoke. Please give this matter your immediate and thoughtful attention, and rest assured that if this society, or any one connected with it, can be of service to you, you have only to call upon us.

The Society also sent letters to the divisions of the Brotherhood of Locomotive Engineers at Chicago calling their attention to the matter in which it is said:

In cases in which it is apparent that the conditions were not such as to have enabled the engineer by exerting reasonable care and diligence to have avoided the smoke, we should be disposed to regard the railroad itself the offender and not the engineer. and we should be disposed to take the position that for a railroad to punish its engineers for making smoke without giving them the means by which smoke may be avoided was a piece of injustice to the engineers. Upon the other hand, if it becomes apparent that the engineer could have avoided the smoke by being reasonably careful, we should be disposed to say that he and not the railroad was the offender.

To the railroads we say: Give your men every facility and every opportunity to control the smoke. Make it as easy for them as possible. By doing this you will serve your own and the interest of the public.

To the engineers we say: Be as diligent and careful as you reasonably can in using every means at your command to suppress smoke. By doing this you will serve your own interests and those of the public.

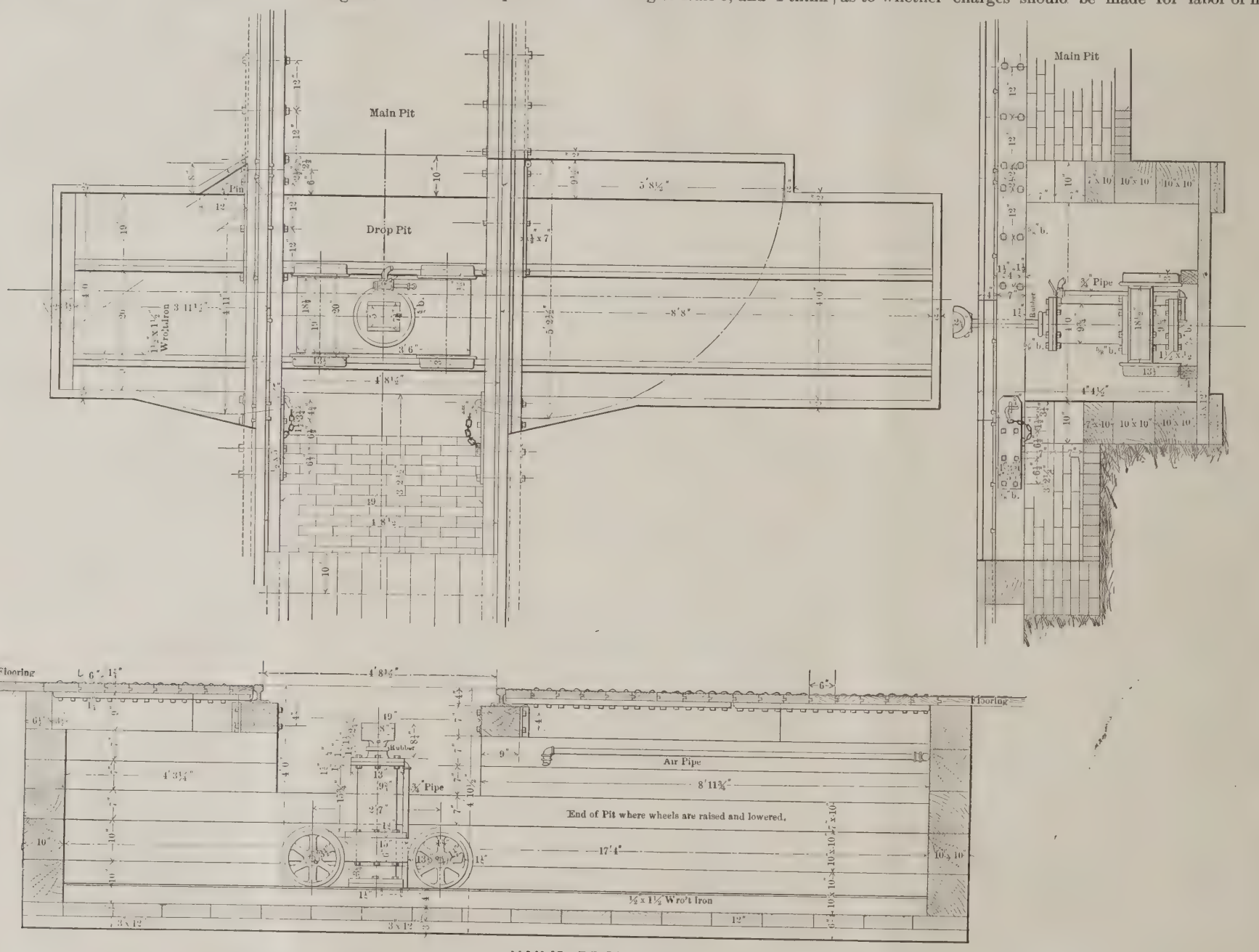
The Michigan Central Railway are placing smoke preventers on their locomotives, which, it is stated, are giving satisfactory results. These preventers are constructed on the principle of the introduction of air to the firebox by the use of a steam jet. There is nothing automatic about the appliance, it being the intention of the company to compel the engineers and firemen to operate it by means of a valve inside of the cab. Positive instructions are to be issued to all crews operating engines to use the smoke preventers while inside of city limits.

Vail's Drop Pit.

The annexed engravings give three views of a drop pit used by Mr. Allen Vail, of the Western New York & Pennsylvania, in his engine houses. A novelty about this form of pit is that it is operated by air or water, as found most convenient. The details of design and construction are so clearly seen in the engravings, that no detailed description is necessary. The saving of time effected by the use of these pits is highly important where locomotives have often to be repaired in a hurry. In writing to us about this appliance, Mr. Vail says:

There is very little that should be said in regard to this machine ; the details of construction are very simple and the amount of labor saved by its use is quite apparent to those who are familiar with the removing and replacing of truck wheels.

This machine is very easily handled and the lowering and raising of wheels and axles in and out of the pit is done in the short space of time of two or three minutes. When air pressure is used, all locomotives equipped with air brakes can furnish their own power, in other cases air pressure can be supplied by some other air brake engine. Where water pressure is used some little time is saved, as there are no air brake couplings to make. We have found this machine to be a great labor saver as well as an expeditious way of changing truck wheels.



VAIL'S DROP PIT.

New England Railroad Club.

The May meeting of this club was held at Boston, May 11, President Twombly in the chair. It was decided not to hold the July meeting of the club.

Col. Frank H. Forbes gave some interesting reminiscences of railroading in Massachusetts 50 years ago. The subject selected for discussion was Rule 8 of the M. C. B. Code of Rules, and was opened by Mr. John T. Chamberlain.

Mr. Chamberlain : The reason that Rule 8 or most of it was adopted at the last Annual Convention of the Master Car Builders' Association was in consequence of the necessity of getting at the private lines in such a manner that in doing their repairs when necessary the railroad companies would be reimbursed. It has been a well-known trick, I think I may call it, on the part of a great may of these private lines to place their mileage and their accounts in such a way that they would be cared for or controlled by railroad companies. There is a rule established in this connection to the effect that private cars when controlled by railroad companies shall be treated the same as cars which are actually owned by the railroads, and in order to get pay for brasses, brakeshoes, truck and body bolsters, springs and the like, which are constantly wearing out, a rule was enacted at the last annual meeting to cover this matter, leaving also in effect the rule that repairs on cars belonging to any railroad company, where the materials are liable to be constantly worn out, such as the articles before referred to, are to be charged to the owner of the car. Almost every man connected with the head of a car department is in favor of wiping out that rule as it now stands, leaving perhaps one or two items, one of which would be as it was last year with regard to roofs lost from cars, and also that if brasses are taken out or brake-shoes renewed or springs changed, the expense shall be to the road making the repairs. On our road, while we have made a good many bills for brasses and brake-shoes many of them have been returned for corrections, and the return of the bills causes annoyance, and extra employment is necessary. As far as railroad companies are concerned, while we have made a good many bills against other companies under Rule 8, we have paid a great many, and our company is no richer than if the rule had not been been enacted; in fact we have lost money if we take into account the extra reports required and the extra help. I think that Rule 8 should be so changed as to give railroad companies the right to make the bills and collect, regardless of where the mileage accounts are kept and of whether the superintendent of the road will make an arrangement with the railroad company whereby they may evade the charges they ought justly to pay.

Mr. Robertson : We have several private lines over our road, and these lines always reimburse us for any repairs that are necessary. I agree with Mr. Chamberlain that there is a large loss of time in making out bills, and extra clerk hire is required in conforming to Rule 8, and I think it would be well to get rid of that rule so far as repairs to running cars are concerned. I think there should be a rule which would cover private lines as to repairs which would conform somewhat to the rule for general repairs on railroad companies' cars.

Mr. Marden: You refer to Rule 8 as a whole, or that part which has reference to brake-shoes and brasses?

Mr. Robertson : I refer to brake-shoes and brasses particularly. We find that the repairs on the cars we receive on our road are very slight outside of brasses and brake-shoes. The least repairs we have to do are on the National Dispatch Line of cars.

Mr. Lauder : I think that the difficulties of carrying out Rule 8 have been to a certain extent exaggerated. It is not a very serious matter to make out bills at the end of the month for such brasses and other parts as properly should be charged under that rule as perhaps the remarks already made would indicate. We send out a good many and some are sent back for explanation. It doesn't take long to dictate a letter to a typewriter, or to send a bill. I think Rule 8 is a very just and equitable rule. I don't think it makes much difference to the railroads whether that rule is in force or not, but I think it is a means of getting hold of private car lines which you cannot reach in any other way. Private lines run a large number of cars all over the country, and once across the continent may wear out the brasses. I oppose the annual tinkering of the Master Car Builders' rules, unless there exists some strong reason for it. It requires a good deal of time for the inspectors to learn new rules, and they are apt to get mixed up and get the superior officers into trouble on that account, and I hope Rule 8 will stand as it is now.

Mr. Fletcher: Speaking about private lines, there are two sides to this question. You seem to think that you only are the sufferers. However, when you lose a car you never replace it. Why? Because you can pay for it cheaper than you can replace it ; and we have had cases where it cost us $200 more to replace one of our cars than we received for it when it was lost. In behalf of the National Dispatch Line, I would say that we use all possible efforts to keep the cars in good running order and spare no expense, and we are always ready to pay any proper bills that are presented to us.

Mr. Marden : I think part of our difficulty in regard to Rule 8, so far as brasses and brake-shoes are concerned, arises from the fact that no specified charge is designated for labor. Different roads charge differently, some half an hour, some an hour, and there is a dispute as to how much time it really takes to change a brass. Quite a number of the roads have issued circulars to the effect that they will not receive any bills with labor charges in them. Other roads have entered into an agreement, one with another, to do away with the labor charge entirely, as far as charging for brasses and brake-shoes is concerned. Some roads have occasion to change more brasses and particularly brake-shoes than others, and there are quite a number of roads which have no bills to make for those articles, while others have a considerable number. I think if any change is made in the rule some provision should be made for a uniform rate of labor to be charged. I believe in charging private lines for running repairs on all such parts as fail under fair usage. I think the mileage they obtain should cover that, and I think it is so intended.

Mr. Lauder : I think there should be something definite as to whether charges should be made for labor or not, and if made the charge should be arbitrary, as it is in other matters. There is no sense in charging an hour to put in a brass, because it doesn't take a man as a rule more than ten minutes to do it, though there might be cases where it would take two or three times that, where the tools and materials are not close at hand.

Mr. Butler : I don't think it is right to charge for the labor. It takes but a short time to make the change. From a good many roads bills are received where there is no labor charged, and in all those cases we do not charge any. Further than that I should be satisfied to let the rule remain as it is.

Mr. Robertson : I think it would be well enough to have the price for brasses and brake-shoes large enough to cover the labor.

Mr. Chamberlain : I don't think a brass can be put in in ten minutes and have it done properly. I made a test of some 20 or 25 cars, coming in just as they ordinarily come, and I found it took an average of 20 minutes to make that change. I have never charged anybody over half an hour for putting in a brass since we commenced with the second month of the operation of the rule; but, as Mr. Butler says, a great many roads have waved the labor charge entirely.

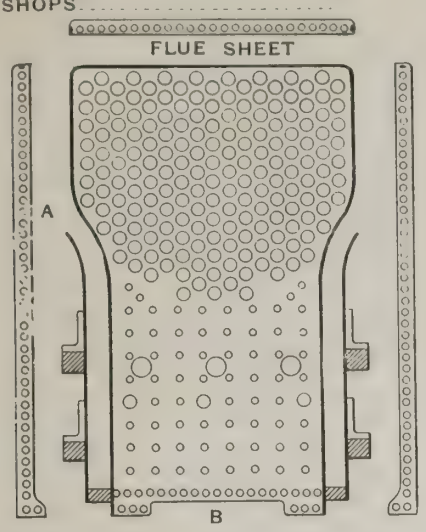
Mr. Fletcher : I should like to inquire if it is considered just and proper to make a charge for renewing a brass where a journal made it hot. I have had bills sent to me from other roads for the same car three days in succession, and they have acknowledged that it was from the brass running hot, and it does not seem to me that is fair.

Mr. Lauder : I think if a brass is worn out by reason of running hot, it is the fault of the road that caused the damage; and it seems to me no one should make a charge either to another road or private car line for a brass that was substituted for one worn out by reason of getting hot. I should not allow it.

The meeting adjourned without recommending any changes in the rules.

Blank for Reporting Firebox Defects.

The following illustration is of a drawing which forms a prominent feature of a blank used on the Chicago, Milwaukee & St. Paul road in reporting flue sheet defects. Other blanks are provided for reporting defects in the side, back and crown sheets.



Report of Firebox Defects—C., M. & St. P. Ry.

The following blank form accompanies the drawing and gives the necessary instructions for its use:

Form 611 C.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

Firebox Sheet Defects, Locomotive. No....

Date.....

Plate Removed.—Number.... Maker.... Size. .. Thickness..... In service..... (date)..... Place..... Life..... Years..... Months..... Mileage..... Total.....

MILEAGE BY DIVISIONS.

Plate Replaced.—Number. . .. Make..... Size.....Thickness.....

Remarks:

NOTE.—Indicate broken staybolts thus—X. Give location of cracks, etc., measuring from lower left hand corner and mark their general direction and length. Indicate corroded or mud-burnt area by line drawn around same, describing it by word "Corroded," "Bulged," "Mud-burnt," etc. Mark location of patches and state whether new or old. Give under "Remarks" the work done on sheet.

The drawing is double the size of our engraving, and the blank form has ample spaces.

By means of these reports a record will be kept of each sheet from the time it is put in the boiler to the time of failure. After a few years this record will be valuable, as it will show the relative merits of the different kinds of steel used in firebox construction, and possibly some effects of different kinds of treatment the boilers receive in service.

Central Railway Club.

At the April meeting of this Club the Secretary reported that it would cost ten or twelve hundred dollars a year to publish the proceedings of the Club in pamphlet form, as was recommended at the previous meeting. Action in regard to the matter was postponed. The committee on amendments to the Rules of Interchange recommended the following alterations. Only those approved by the Club are given:

Section N, Rule 3. "Axles broken or bent so as to throw a variance of one-half inch or over in a measurement between the widest and narrowest limit between flanges."

This was amended by Mr. Macbeth to make the variation three-eighths instead of a half-inch, and in this form it was adopted.

Section H, Rule 3. "Broken or chipped flanges—If the piece broken off exceeds 2 inches in length and ¾ inches in width, or if it exceeds ⅛ inch past center of flange."

Paragraph 5, Section U, Rule 3. "Drawbar keys and followers must be sound, and stops properly secured to draft timbers."

Section Y–4, Rule 3. "Cars with two-hole center plates must have both bolts effective."

End of Rule 5. "And is not to be removed, and used as a voucher until repairs are made."

Section D, Rule 8. "Truck or body bolsters, spring planks, truck transoms, and truck springs broken; provided that car was not derailed or wrecked."

Mr. Waitt moved to eliminate the labor charges and strike out Sections B, C, D and E.

Mr. Chamberlain moved to amend by simply eliminating the labor charges. Carried.

Mr. Waitt moved to amend Section Y2 by striking out the words "diagonally opposite." Carried.

Mr. Bonnar moved that the action heretofore taken in regard to a change of gauge of sharp flanges be again called to the attention of the arbitration committee. Carried.

Mr. Mackenzie moved that Rule 30 be so modified as to authorize the arbitration committee or committee on revision of rules to decide cases on the basis of equity as well as under the rules. Carried.

The next regular meeting of the club will be held in September.

New York Railroad Club—April Meeting.

At the regular meeting held April 21 there was no subject assigned for discussion, but the members introduced several topics.

The inconvenience and unpleasant predicaments caused by the frequent loss of defect cards from cars to which they have been applied were discussed by Messrs. West, Adams and Smith.

LOCOMOTIVE DETAILS.

Mr. West said that he found that putting a dead plate over about 20 inches of the forward portion of the grates very materially reduced the leaking of flues and the necessary work upon them, and that whenever the plate or grates beneath it became injured sufficiently to admit a current of cold air the flues started leaking.

Mr. Mitchell said they had used such a plate on his road for several years and its efficiency in preventing leaking flues had become so well recognized by the enginemen that if the plate became displaced it was reported just as quickly as a hot journal would be.

In the discussion of the matter it was developed that several of the members used anthracite and bituminous coal alternately in the same firebox with equal success.

Mr. Mitchell: We have engines that burn both kinds of coal. We run west with hard coal, and come east with soft. In nearly every engine we have cast iron shaking grates, and those engines will steam freely with hard or soft coal.

The President said that on his road much trouble was had from their engines throwing fire and asked for suggestions to prevent it. A member suggested compound locomotives, saying that on his road they had six compounds and there was no fire thrown from them, while their simple engines threw fire.

The President: We took a locomotive from our shops with the gasket under the exhaust pipe blown out about 1½ inches, and when the pipes were put back a new gasket was put in. The engineer complained right away that something had been done to his engine for it did not steam as well. There had been nothing done except a new gasket applied. It gave us a thought, to drill two ⅜ holes directly in near the bottom about 6 inches from the top of the joint, directly in the front of each exhaust pipe, and we certainly had very good results from it. It does not injure the steaming qualities of the locomotive, and it does deaden the sparks.

ROLLER BEARINGS.

Mr. Adams: We have one car equipped with Meneely roller bearings doing very well. Our first experience was a failure. The rollers crushed. On our own responsibility we took the trucks out and renewed the rollers, and since that time, which is perhaps three or four months ago, they have been running very successfully. I have not heard the slightest complaint. We made some experiments at one time with a ball-bearing journal. We fitted up a car. We put in balls of about ⅜-inch diameter, 320 balls in each journal box. They ran very easy; reduced the friction about six times, as near as we could test by the dynamometer and handling. The car ran very finely for about four months. It was a four-wheel car, but it carried about 11,000 pounds on the journal, which was an excessive weight. We are running some 30 cars with that same weight on them on an ordinary brass bearing and do not have any hot boxes.

We ran the ball-bearing journal about four months, I guess. Somebody had the curiosity to look into the box, and opened it, and part of the balls fell out, so the thing started out with the balls partly gone and the cover loose, and it ran long enough to melt the balls and the thing was a failure. We took it back in the shop and I had it fitted up again, and it did not run for more than two weeks before it got hot again and melted the whole thing, and we concluded to abandon it. I am rather inclined to think if it was fitted up in good shape it would make a very successful bearing. But it would cost too much to undertake to do it on any considerable amount of work.

The balls were made by the Symes Rolling Machine Company, rolled not turned. They were made extremely hard. The file would scarcely take them. The axle was incased with a steel band that was hardened as hard as the balls, or as hard as they could make it. We took a 3¾ journal and put a steel sleeve on it and shrank it down tight. It was extremely hard. There was also a sleeve around the box and that was hardened too. In that way it brought the balls between two hardened surfaces.

I am told by mechanical engineers that roller bearings or ball bearings, though reducing the friction largely, are an advantage only in starting the train. I suppose that is a fact. It seems to be generally agreed upon. That is, at a low rate of speed you reduce your friction very largely, and as soon as you get your speed up to 25 or 30 miles an hour you lose all the advantage of the reduction of friction.

Mr. Rogers said he had fitted a car with a ball bearing at one end and a roller bearing at the other, loaded it with 20,000 pounds of car wheels, and run it for about three months. The engines could haul about 16 cars per train equipped with ordinary bearings, but the car with the roller and ball bearings pulled so easily that the engineers thought they could haul 32 cars per train if equipped with such bearings At the end of three months they began to pull hard, and upon examination it was found that the ball bearings had worn grooves in the axles, and the axle was simply rotating on points. While the bearings were new, before they began to reduce in diameter, they fitted very nicely; but after they began to reduce in diameter they got out of parallel with the axle, and eventually the car pulled, if anything, harder than with the brass bearings.

The President had doubts about the ultimate success of roller bearings, but said: "We have been using the roller bearing about three years and I think during that time Mr. Meneely has made four changes. He claims he has got the right thing all right now. He has got four cars fitted up and it reduces the friction about four to one. We cannot complain of the way the cars run now; we are running them on fast trains on our main line; you will all have an opportunity of riding in the cars and seeing them at Saratoga. All the electric cars running in Albany up those high grades are equipped with those new journal bearings and are doing excellently. I do not think they could take a car up those grades with the old brass bearings."

A freight train containing 131 cars was recently hauled on the New York Central.

The Western Railway Club.

The April meeting of the Western Railway Club was held at Chicago, April 19, President Peck in the chair.

The topic of discussion was the "Rules of Interchange." The report of the committe on revision of the rules had been received at the March meeting, and the chairman, Mr. Barr, presented a revised list of hours of labor to be charged for certain car repairs. The revised list as presented by the committee and after some discussion recommended by the club is as follows:

	Hours.
1 Draft sill	36
2 Draft sills	45
2 Intermediate sills	40
1 Intermediate and one draft sill	42
2 Intermediate and two draft sills	52
1 Intermediate sill	23
1 Side or intermediate sill spliced	13
1 End sill	2
1 Draft tumbler	6
2 Draft tumblers (on same end)	10
1 Cross tie timber	8
1 End post	6
2 End posts (on same end)	9
1 Corner or side post	8
1 Swing bolster	6
1 Swing plank	5
1 End plate	18
1 Drawbar	2
1 Door stop side	2

Two cents per square foot for all sheeting, lining and roofing; one cent per square foot for flooring; three-fourths cent per square foot for paint and nails.

The suggestion of the committee that the club recommend that old defects be carded for only by the owner of the car was adopted by a small majority after considerable discussion.

The next question that came up was doing partial repairs on defect cards.

Mr. Rhodes: My recollection is that the Arbitration Committee made a recommendation last year to the effect that running repairs or repairs to air brake rigging, brake gear, brake beams, etc., should be carded on separate cards to more permanent repairs; but when this matter came up before the annual convention I believe it was voted down and the association refused to indorse anything of that kind.

Mr. Townsend: There have been several cases where I have made partial repairs, but they have been on loaded cars, and I couldn't do anything else; I could not make all the repairs. I made the repairs and left the cards on the cars just as they were, and then wrote to the parties, telling them what I had done, and asked them if they would allow me to make a bill; and in all but one case they have permitted it.

Mr. Riley: Our custom is to make repairs, providing they do not cost more than one dollar on any loaded car, and not make any bill.

Mr. Rhodes: I would like to see an addition made to Rule 3. There is a great deal of attention now given to brakes, and very few companies are without the air brake on their new cars. The other day I saw some new 50,000 lbs. cars without air brakes, and the hand brakes on one truck only. It appears to me that cars of 40,000 pounds capacity and over, which don't have brakes on both trucks, should be liable to rejection. I would not approve of such a rule applied to cars of less than 40,000 pounds capacity, because there are a great many of the lighter cars running with hand brakes on one truck only; but it would seem that all cars of 40,000 and over ought to have hand brakes on both trucks, and if the Association puts a clause of that kind in the rules, it will attract attention to it. As it is now, attention is not directed to it, and some railroads are building cars and putting the brakes on only one truck. I move that it be recommended to the Association that the following clause be added to Rule 3, among defects for which cars may be refused: "Cars of 40,000 pounds capacity and over which do not have brakes on both trucks." (Carried.)

Mr. William Forsyth moved that a clause be inserted in Section U of Rule 3, reading: "Tail bolts for cars of 40,000 pounds capacity and under, not less than 1¼ inches diameter; tail bolts for cars of 50,000 pounds capacity and over, not less than 2 inches diameter.

Mr. Schroyer: Mr. President, I would like to amend that by adding the words "cars with automatic drawbars," instead of 50,000 pounds and over. We do not want to have cars with automatic couplers and 1½ inch tail bolts, and thereby wreck our trains.

Mr. Townsend: I had a case where the tail bolt head pulled out through the drawbar and wrecked six cars.

Mr. Rhodes: I think it is generally recognized that the draft gear on our freight cars is at the present time the weakest part of our equipment. There are more railroad accidents resulting from broken draft rigging than anything else to-day, and it is time that more attention is given to

I know that in this matter of drawbar attachments there is a great change during the last year in the sentiment among the railroads. The reasons of this are twofold, I think. In the first place, when we had slower train speeds, lighter cars and lighter loads, we were able to use an inferior draft rigging attachment with comparative success; we were able to use without difficulty 1¼ or 1½-inch bolts, and accidents from their breakage were not common. But now we run at a higher speed, and have 60,000 pound capacity cars and large locomotives, and the weakness of these parts has become more pronounced, so much so that some railroads are abandoning tail bolts.

There is another thing to remember; you won't find any laboratory expert taking a bar to test and attempting to hold it with a bolt, even two inches in diameter. He realizes that it won't stand the test up to 120,000 or 130,000. They are always tested with something stronger in the way of a special bolt held with a clamp. That is the strongest possible argument for the use of a yoke. We ought to instruct our inspectors that it is criminal to put less than a two-inch bolt where the bar will take a bolt of that size. Do not let these small bolts go in. The material is poor enough as it is. I think it is desirable to get something in our rules that will call attention to it.

Mr. Forsyth's recommendation was carried.

A motion by Mr. Schroyer that the club recommend a rule requiring the issue of duplicate defect cards for lost or illegible cards was carried.

The following is the Atchison, Topeka & Santa Fe's showing for nine months of the current fiscal year, July 1, 1891, to March 31, 1892: Gross earnings, $27,440,688; increase, 2,230,589; net, $8,316,310; increase, $1,356,622.

Meeting of Supply Men at Saratoga.

It has been agreed upon that the Supply Men meet on Tuesday evening, June 14, at Congress Hall Hotel, Saratoga Springs, and arrange their programme for the coming conventions.

It is hoped there will be a large attendance.

Cincinnati as a Wood-Working Machinery Center.

In a recently published interview with Mr. Thos. P. Egan, President of the Egan Company, of Cincinnati, O., one of the most extensive manufacturers of wood working machinery in the world, he is reported as saying; "Cincinnati may well feel proud of her commanding position as a manufacturer of machinery. In 1864, when I first went into this branch of machinery, the business was very small and very contracted. Not two hundred men were engaged in it, and the machines were wood frames, the most of them made to order, or as each operator wanted them. Now there are fully five thousand men in this and kindred lines, and the machines are all of iron and steel. The designs and improvements are superior to any in the world and are sought after so much that foreign governments stipulate in their requisitions, 'machinery from Cincinnati or equal to it.' It has been remarked that on account of the great reputation of two concerns in this city they brought buyers from all parts of the world and allowed several of the smaller concerns to grow up and improve.

"We have the best facilities in Cincinnati for manufacturing, coal and iron are cheaper than in any other city, material of all kinds is easily obtained and our workmen are mostly the best class of Germans, and our position gives us the benefit of lower freights to all points. I am personally acquainted with several manufacturers who were recently induced to change their location, and one and all admit they made a mistake and wish themselves back in Cincinnati. In the recent flurry in Chili the government of the United States wanted a full outfit of machinery for the navy yard at Norfolk, Va., and wanted it at once. By special contract Cincinnati again carried the day and filled the order for 32 machines made by the Egan Company. At Paris, Vienna and London the Cincinnati concerns carried off the honors. Don't forget to watch Cincinnati at the World's Fair at Chicago and see if she does not hold her own.

"Our company has made applications for 20,000 square feet of floor surface in Machinery Hall in order to display some 40 different machines all in actual operation, and all of them of our own construction and origin. Cincinnati as a machinery market is now the largest in the world, and is becoming more and more expanded every day."

An exhibition of the "Fox Emergency Train Stop" was given on the New York & Northern Road, near New York, on March 31. A number of railroad men and others were present and saw the tests of the new appliance, which were successful.

An engine, equipped with the "stop" and drawing three passenger cars, was used. This device is applied to the locomotive and air brakes, and when it comes in contact with a ground device placed near the track applies the brakes on a moving train automatically. The appliance is intended to be placed in connection with switches, draws and grade crossings, and should the danger signal be shown and disregarded by the engineer, this appliance would apply the brakes and the train would be stopped.

Some fast time was made by the Columbian Express, No. 25, on the Pennsylvania Railroad, May 15. Between Crestline and Chicago one hour and 38 minutes lost time was made up. The regular running time between Fort Wayne and Chicago is four hours and 15 minutes, but the train in question made it in two hours and 58 minutes. The train was composed of six cars, three being sleeping cars. From Plymouth to Wheeling, 67 miles, was covered in 70 minutes; Valparaiso to Whiting, 27 miles, in 25 minutes.

The statement of the operations of the Wagner Palace Car Company in 16 states and the Dominion of Canada for the quarter ended March 31 last shows that the gross receipts were $699,634, and that the expenses paid, including the building of new cars, amounted to $872,374. For the corresponding quarter last year the company's earnings were $663,798 and the operating expenses $642,170.

As Mr. James Malloy, a passenger on a Chicago, Milwaukee & St. Paul train, was attempting to pass from one coach to another on May 20 he was, it is reported, blown from the train into a ditch and fatally injured.

The tropical island of Mauritius was visited by a destructive hurricane on April 29. One-third of the capital city, Port Louis, was destroyed. The number of persons who lost their lives is estimated at 1,200.

The United States Mineral Wool Company, of No. 2 Cortlandt Street, New York, has issued a neat little pamphlet descriptive of the uses of "mineral wool" as an insulating material in car building and steam engineering. In the case of cars, heat is lost both by radiation and contact of cold air, but the cooling by the first process is inconsiderable in comparison with the last. With great differences of temperature it has been shown that the loss of heat increases in a much higher ratio than that difference—in other words, the colder the weather, or the greater the difference between the external and internal air, the more rapid the extraction of the heat, and, furthermore, as the speed of the car increases, the loss of heat increases, because of the contact of a greater amount of cold air in a given time. A lining of "mineral wool" is said to be most effective in deadening sound and preventing the transmission of heat through the sides and ends of cars.

A Gross Misstatement.

Editor National Car and Locomotive Builder:

Mr. C. B. Dudley has recently made some analyses of the anti-friction metals, among which is the Magnolia metal.

There are gross errors in the analysis of Magnolia metal, and those of other anti-friction metals are incorrect.

If these analyses are instances of his skill as a chemist, it would be well for the public and for him to quit the business.

Below is a statement of eminent authority on anti-friction metals bearing out the above statement.

MAGNOLIA ANTI-FRICTION METAL CO.
No. 30 WALL STREET, NEW YORK, May 1, 1892.

In the analysis of Magnolia metal Dr. Dudley has overstated one constituent part, and has omitted tin (which it always contains), and other materials. On the same page is given an analysis of antimonial lead, which may be correct, but not an ounce of this is ever used in Magnolia metal.

Respectfully yours, H. G. TORREY,
U. S. Assayer in U. S. Mint Service, New York.

The Congdon Brake Shoe Company has removed its offices from the Phenix Building to Suite 1014 Monadnock Building, Chicago.

The Northwestern Improvement Company has changed its offices and is now located at 1023 Monadnock Building, Chicago.

The American Continuous Drawbar Company, of Aurora, Ind., has placed over 8,000 of their improved draft and buffing apparatus upon cars within the last 60 days.

The Chicago offices of the Short Electric Railway Company have been moved from 225 Dearborn Street to the new Monadnock Building, corner of Dearborn and Jackson streets, Chicago.

Mr. C. E. Mark, of 1042 Central Avenue, Cleveland, O., wishes to correspond with those interested in car couplers, with the view of forming a company to manufacture and sell his improved automatic car coupler.

After a continuous use of the "Jewett Anti-Friction Device" for one year on the Boston & Albany passenger cars the company is now equipping 40 cars with the device and have ordered it for the entire passenger equipment of the road.

"Cosmetic" manufactured by Stevenson Bro. & Co., of 132 South Second Street, Philadelphia, is a substance growing in favor for coating bright work of machinery and locomotives to prevent rust. It is said to be cheaper than white lead or tallow and easier of application and removal.

The Lunkenheimer Brass Manufacturing Company, of Cincinnati, O., has issued a new catalogue for 1892, descriptive of its articles of manufacture, including almost everything in the line of brass used about locomotives from cylinder cocks, and rod and guide cups, to sight feed lubricators.

The D. Van Nostrand Company has issued a new catalogue of books on steam, steam engines, machinery, mechanics and mechanical engineering. The catalogue contains a good index and names many books that would be of value to railroad mechanical men. It will be sent gratis on application to the publishers, 23 Murray and 27 Warren streets, New York.

At the annual meeting of the American Steel Wheel Company held recently in New York Mr. J. H. Olhausen was elected Vice-President and Mr. Samuel Garwood, Secretary and Treasurer. It was decided to remove the secretary and treasurer's office from Boston to the general offices of the company, New York City. All communications to the Secretary and Treasurer should be addressed as above.

The Buffalo Forge Company, of Buffalo, N. Y., have been spending considerable time and money in securing special tools, templates, presses and punches for making their steel plate planing mill exhausters. These exhausters are built of the best material in a thoroughly workmanlike manner, and to run with little power, to be durable, and so proportioned as to give the greatest suction and expulsive power obtainable.

The American Steel Wheel Company, in order to test their steel knuckles, sold to the Philadelphia & Reading during the early part of last summer 1,000 M. C. B. knuckles under a guarantee to replace all breakages occurring inside of six months, and under date of January 8, Mr. Paxson, Supt. M. P. & R. E., reports that but two of this number had broken. This would appear to demonstrate that this steel is peculiarly adapted to this service.

An illustrated catalogue of the graphite productions of the Jos. Dixon Crucible Company, of Jersey City, N. J., has been received. It will be sent gratis to those who have occasion to use graphite productions in any form. Dixon's graphite pipe joint grease is recommended as being cheaper and better than red lead for steam fitting. Those desiring to use the best kind of pencils for all different purposes, or any other graphite productions, should send for the catalogue.

Any one having occasion to visit Dunkirk, N. Y., or the Brooks Locomotive Works at that place, will find first class accommodations at the Hotel Gratiot, a new hotel just opened opposite the City Hall. The systems of plumbing, ventilation, electric bells and fire escapes are all on the most improved plans. Free omnibuses from the hotel meet every train; and electric cars meeting all trains, running to all parts of town, and connecting Dunkirk with Fredonia, pass the hotel.

Few things appear to have been so almost generally acceptable in the machine shops of the country as "R. Mushet's Special Steel." Genuine merit tells in the long run, and this is undoubtedly the reason for the success of this brand of steel. Like other good things it has encountered some imitators who are offering the advantage of lower prices, but in view of the fact that those who know Mushet's merits best say that they cannot afford to use any other brand it appears that price is "not in it."

"Sparks from the Crescent Anvil" is the title of a little paper just making its first appearance in Chicago. The initial number is issued as an experiment by the Crescent Steel Company's Chicago and New York sales agents, its editors. The object is to afford a medium for the publication of items of interest relating to steel and its treatment, which will be helpful to toolmakers, steelworkers, and to all who are interested in the manipulation of fine steel; and, incidentally, to advertise the good qualities of Crescent steel.

The Hackney Hammer Company, of Cleveland, O., has now over 100 of its hammers in use in different parts of the country, and on the various kinds of work for which such a tool is used. As the hammer has only been on the market a year and a half, this is a good showing. The company has supplied with hammers such firms as the Thomson-Houston Company, Lynn, Mass.; The Pennsylvania Iron Works Company, Philadelphia, Pa.; The Tredegar Company, Richmond, Va., and many other firms of prominence.

The "Fluoride Water Purifier" is the name of a new compound for, as its name indicates, the purification of feed water for locomotive and other boilers. It is sold as a white crystalline powder, dry and free from water, which means that the purchaser does not pay for water at a dollar or more per gallon when buying a scale preventer, but gets full weight of chemical for every pound bought. It can be kept in wood or paper indefinitely without deterioration or melting. It dissolves readily in cold or hot water, forming a lightly alkaline solution that neutralizes acidity in the water. It is said to contain no acid or fatty matter nor any chemical that will in any way injure iron or steel, and it is not harmful to handle. The compound is sold by the American Fluorine Company, offices 126 Liberty Street, New York, and 73 and 75 West Jackson Street, Chicago.

We have received from the B. F. Sturtevant Company Boston, Mass., a nicely illustrated book of 130 pages, tastily bound and entitled "500 Representative Buildings Heated and Ventilated by the Sturtevant System." Its object is distinctly implied in its short and pithy introduction, which reads, "The high character of the buildings herein illustrated betokens the quality of the system by which they are heated and ventilated."

Most of the illustrations are from specially prepared pen and ink sketches, printed in colors and forming a succession of pleasing pages.

The entire work is indicative of the scope and success of the Sturtevant system, which, by means of a fan, acts positively to force air to all parts of a building. The book is designed for distribution among architects, heating and ventilating engineers and others desirous of obtaining information regarding the system.

Our Directory.

Atchison, Topeka & Santa Fe.—C. F. Resseguie has been appointed Superintendent of the Southern Division, with headquarters at Wichita, Kan., to succeed J. H. Parsons, resigned. J. H. Parsons, Division Superintendent, has resigned.

Brooklyn, Bath & West End.—E. H. Davis has been chosen President in place of J. M. Butler.

Central of Georgia—G. D. Wadley has been appointed General Superintendent, vice V. E. McBee, resigned.

Chicago, Rock Island & Pacific.—W. H. Stillwell has been appointed Superintendent of the Iowa Division. A. J. Hitt has been appointed Superintendent of the Eastern Division.

Cincinnati, Lebanon & Northern.—G. F. Gardner has been appointed General Superintendent.

Elizabethtown, Lexington & Big Sandy.—G. Lewis has been appointed Superintendent.

Lake Shore & Michigan Southern.—D. G. Sutfin has been appointed Superintendent of the Western Division.

Lehigh Valley.—T. H. Fennell has been appointed Superintendent of the Buffalo Bivision.

Mobile & Birmingham.—J. D. Clark has been appointed Superintendent.

Montpelier & Wells River.—W. A. Stowell has been appointed General Manager.

New York, Lake Erie & Western.—J. H. Barrett, Superintendent of the Erie Division, has resigned.

Northern Pacific.—N. Kline has been appointed Superintendent Seattle, Lake Shore & Eastern Division.

Philadelphia & Reading.—T. H. Fennell has been appointed Superintendent of the Buffalo division.

Pittsburgh, Chartiers & Youghiogheny.—J. B. Safford has been appointed General Superintendent.

Rome, Watertown & Ogdensburg.—Edward Van Etten, recently appointed Superintendent of the road, will assume the duties of his position on May 10, with headquarters at Syracuse, N. Y. I. H. McEwen, formerly Superintendent, will become Assistant Superintendent on that date. E. S. Bowen, General Manager, has resigned.

Seattle, Lake Shore & Eastern.—H. H. Warner has been appointed Master Mechanic, with office at Tacoma, Wash.

Sioux City & Northern.—J. C. Coombs has been appointed General Superintendent.

Texas & Pacific.—L. S. Thorne has been appointed General Superintendent. J. A. Grant, General Manager, has resigned.

Union Pacific.—M. Patterson has been appointed Master Mechanic at Salt Lake City, Utah, vice A. C. Hinckley, resigned.

West Shore.—T. Aldcorn, Division Master Mechanic, has resigned.

Utah.

The land of sunshine and flowers—rich also in mineral and agricultural resources—is best reached by the Rio Grande Western Railway. See that your excursion tickets read both ways via that road, which offers choice of three distinct routes and the most magnificent railroad scenery in the world. Send 25 cents to J. H. Bennett, Salt Lake City, for copy of illustrated book, "Utah; A Peep into the Mountain Walled Treasury of the Gods."

NATIONAL CAR AND LOCOMOTIVE BUILDER

JULY, 1892.

CONTENTS.

The Northern Pacific Edison shops are at work upon their first order, which is for 200 of Street's stable cars.

The St. Louis, Vandalia & Terre Haute has let a contract for building 10 passenger cars to St. Charles Car Company.

The general offices of the Richmond & Danville Railroad have been moved from Atlanta, Georgia, to Washington.

An electric railway is projected which is to run from St. Petersburg to Archangel, Russia, a distance of more than 800 miles.

The Chicago, Burlington & Quincy has contracted with the Pullman Palace Car Company to build 55 standard chair cars.

The Cooke Locomotive and Machine Company has completed an order for 22 10-wheel engines for the Houston & Texas Central.

The New York, Chicago & St. Louis is reported to have ordered 1,000 cars of 60,000 pounds capacity with air brakes and M. C. B. couplers.

A cablegram from London says that the original portrait of Pocahontas, painted in 1612, has been secured for exhibition at the World's Fair.

A Chicago & Grand Trunk locomotive exploded one mile east of Climax, Mich., June 14, fatally injuring the engineer, the fireman and a brakeman.

A new company, which will erect a line between Philadelphia and Cape May is being organized. The road is to be operated by the Reading company.

The Chattanooga Car and Foundry Company is preparing to engage in the manufacture of passenger cars, and is increasing its capacity for this purpose.

Eleven new baggage and express cars, recently built by the New York Central & Hudson River road at its West Albany shops, have been placed in service.

A freight train on the Northern Division of the Chicago, Milwaukee & St. Paul Railroad was wrecked by a washout at Hartford, Wis., June 7. Three men were killed.

A recent wind storm blew down 275 feet of the inner wall of the uncompleted Manufacturers' Building of the Worlds' Fair. The damage is estimated at $5,000.

The Dickson Manufacturing Company, of Scranton, has begun the delivery of the 10 consolidation engines ordered by the New York, Ontario & Western early in May.

A westbound local passenger train on the Grand Trunk railway ran off the track near Hillhurst, June 20, owing to a washout. The engineer, fireman and express messenger were killed.

The London Polytechnic has already booked more than 800 for the World's Fair tour which it has undertaken to manage for English artisans, and the number is being increased daily.

A fire in the car shops of the Rathbun Car Works, at Deseronto, Ont., recently destroyed the south end of the erecting shops and some valuable machinery, causing a loss of about $20,000.

It is stated that wasps' nests often take fire, supposed to be caused by the chemical action of the wax upon the paper material of the nest itself. This fact may account for many mysterious fires.

The Southern Pacific is receiving 22 passenger cars from the Pullman Company, which were ordered in January. Sixteen new cabooses have just been completed at the Sacramento shops.

Exhibits from the Pacific coast States for the World's Fair will be charged only half regular freight rates each way. The Transcontinental Association has made a decision recently to that effect.

The St. Thomas shops of the Michigan Central have just completed two elegantly appointed passenger cars and a baggage car for the Niagara branch, which are said to be the first passenger cars built at these shops.

On the morning of June 24 two freight trains on the Pennsylvania Railroad while running at high speed collided two miles east of Huntington, Pa., blockading both tracks and demolishing two engines and 18 cars.

It is reported that a ship load of cedar from the territory of Misiones, on the Rio de la Plata, Argentine, is to be sent to the United States this month, which is the first of a series of similar shipments that are to be made.

The International Tin Plate and Refining Company has been organized in Chicago. Articles of incorporation have been applied for, the $200,000 of capital stock has been subscribed and work on the company's plant will begin within 30 days.

As a result of the recent flood in the Mississippi region the railroads centering in East St. Louis have decided to increase at least two feet the height of their tracks for a distance of two miles, which is beyond the height reached by the water.

The broad-gauge railway ceased to exist in Great Britain on May 21, when the Great Western railway was changed to standard gauge. The peculiar construction of the track necessitated a change in the roadbed of more than 200 miles of track in one day.

A new railroad company, with a capital stock of $50,000, to be known as the Chicago, Evansville & Southern Railroad, which is to be built parallel to the Evansville & Terre Haute, has been formed at Evansville, Ind., with Dr. A. M. Owen as President.

It is stated that the Central Railroad of Brazil is in need of extensive additions to its rolling stock, owing to the large increase in local passenger traffic. To meet the exigencies of the occasion it is affirmed that 100 new locomotives will have to be ordered.

At Latrobe, Pa., on the evening of June 15, a number of men became disorderly on a passenger train of the Ligonier Valley Railroad, and, on being asked to pay their fares started a riot, in which a brakeman was killed and two or three other persons badly injured.

The Baltimore & Ohio shops at Mount Clare, as well as several of the large steel works and shipyards, have been recently visited by J. K. Trnovsky, engineer of the Austrian Northern Railroad Company, whose purpose was to study American methods and mechanics.

Plans have been prepared by the Great Northern for machine shops, car repair shops, roundhouses, passenger and freight stations for the division headquarters at Spokane, Wash. The machine shop will have a capacity of 75 engines a year and will give employment to 250 men.

The Schenectady Locomotive Works have completed a large part of the order for 27 compound locomotives for the Southern Pacific. Twenty of the engines are 12-wheel compound intended for freight service on the Mountain division, and the balance are 10-wheel engines for passenger service between Oakland and Sacramento.

The railway traffic of Chicago has been stated to be as follows, the figures being the number of trains per day:

Though express and mail trains	262
Accomodation and suburban trains	660
Freight trains	274
Grain, stock and lumber trains	164
Total regular trains	1,360
Number of companies operating	28
Number of lines operating	40

The New York Central has begun relaying the tracks through the Fourth avenue, New York, tunnel, with 100-pound steel rails. The intention of the company is gradually to place the new rail on the track of the entire Hudson River division, as part of the plan to prepare for the heavy traffic expected in connection with the Chicago Exposition.

On Friday, May 27, a special train with invited guests made a round trip over the Chicago Elevated road. The Mayor, City Council and many prominent business and railroad men were in the party. The general impression was that the equipment and roadbed was of the best, and that the comfort of the passengers had been the main point sought after by the company.

Omaha, on June 17, voted $750,000 in bonds to aid the Nebraska Central Railroad Company to build a bridge across the Missouri River, a union station in Omaha and 100 miles of railroad north from Council Bluffs. The object is to give all Eastern roads a chance to enter Omaha on reasonable terms and thus to break down the embargo imposed by the Union Pacific bridge.

The contract for 10 new passenger engines for the Baltimore & Ohio Railroad has been given to the Baldwin Locomotive Works, of Philadelphia. The engines are to be completed by the middle of August. Three of them will be built according to designs of the Baldwin Locomotive Works and seven according to designs of Mr. Hazelhurst, General Superintendent of Motive Power of the Baltimore & Ohio.

The *Manufacturers' Record* says that "during the second quarter of this year there have been organized in the South 761 new industrial enterprises that we have been able to trace and verify. The number of similar enterprises organized during the first three months was 741, making the total for the first half of the year 1,502. The figures for this half year show an exceedingly gratifying condition of affairs in the South."

An east bound passenger train on the Chicago, Burlington & Quincy Railroad was wrecked by a broken rail near Indianola, Neb., June 5. Five Pullman sleepers were turned over. The passengers were transferred, and the train proceeded to Omaha. Among the passengers was a party of about sixty editors with their families returning from the meeting of the National Editorial Association at San Francisco. No one was seriously hurt.

The latest steamship move on the part of the Northern Pacific road is destined to add greatly to the prestige of the city of Tacoma. In addition to the city being a terminus of railroads of great importance the steamship interests are becoming very important. The Northern Pacific has entered into a traffic agreement with the Guion Steamship Company by which the latter will run three steamers between Tacoma, China and Japan.

A statement is published that articles of incorporation of the San Francisco & Atlantic Railroad have been prepared in San Francisco and will soon be filed. It is given out that this line will be in process of actual construction within 60 days, and that it will run from San Francisco to Los Angeles, making connection at Cramer, on the line of the Atlantic & Pacific road, with the Atchison system. The distance to Los Angeles will, it is said, be about 485 miles.

English rail exports to the Argentine in April were but 2,245 tons, as compared with 10,038 tons in April, 1891, and 29,808 tons in April, 1890. The effects of the practical collapse of the Argentine demand for British rails has been very serious, as Argentine was for many years one of the best clients of British ironmasters. English exports of iron and steel rails in all directions sunk in April this year to 26,723 tons, as compared with 44,766 tons and 41,731 tons in April, 1891, and April, 1890, respectively.

The *Manufacturers' Gazette* says that when it is desired to obtain a casting where the pattern is so crooked that it would cost more than the article is worth when done, a good method is to make a model of beeswax. This the founder molds within an iron flask in solid sand with no parting and no opening except the gate hole and vents. The flask is then placed in the core oven in an inverted position, so that when the wax model melts it will run out, leaving a perfect mold and insuring a good casting at small cost.

The Barney & Smith Manufacturing Company of Dayton, O., has passed into the hands of a newly formed organization. The new company is incorporated under the laws of New Jersey, with a capital stock of $4,5 0.000, divided: One million dollars 6 per cent. fifty-year bonds, $2,500,000 in preferred 8 per cent. stock, shares $100 each, and $1.000,000 of common stock, shares each $100. As is well known the works of this company are second only to the Pullman works in extent and capacity. It is understood that there will be no changes in the management.

The Paris-Lyons Company has adopted an ingenious device, which, it is expected, will put an end to the great amount of trouble experienced by passengers in finding their proper carriage after leaving it at way stations, and render it easier for trains to start punctually from intermediate stations. It is due to Mr. Edouard Gros. M. Gros remarked that the number painted outside the carriage, often running into five figures, is the very last thing that will strike a passenger or fix itself in his memory. His device consists in placing outside the carriage an enameled plate with a symbolical figure, in black and white.

Herr Brettman, of the Prussian State Railways, has suggested the use of electricity for switching cars at stations. He states that as done at present by locomotives the cost is very high. During the year 1889-90 an aggregate of upward of 10,000,000 hours were spent by different locomotives in this class of work, the fuel alone costing over $5,000,000. If to this is added the wages of the drivers and stokers, it appears that 19 per cent. of the total cost of the train service is spent in switching. He thinks that by the use of electric capstans, and in some cases of motor cars, the cost of this service could be materially reduced.

While engineers are familiar with the action of other forces upon metals generally, they are yet much in doubt with regard to shearing. Hydraulic machinery is claimed to be the only available kind for accurate shearing tests. From cards taken it is found that it requires more power to cut iron than steel of the same dimensions, and less power for both metals than is generally supposed. This difference in the behavior of these two metals is attributed to the brittleness of steel compared with the tougher iron. A case is cited of a pin breaking in a compressing machine which persistently sheared off very suddenly, sometimes even under a strain less than its elastic limit.

American Railway Master Mechanics' Association Convention.

The Twenty-fifth Annual Convention of the Master Mechanics' Association convened at Saratoga, June 20. President John Mackenzie called the meeting to order at 9:15 A. M. and the proceedings were opened with prayer by the Rev. S. W. Nicholson. The President of the village, Mr. Mitchell, was introduced and delivered an address of welcome. President Mackenzie then delivered an address, after which the roll was called and the reports of the Secretary and Treasurer presented. A letter from the American Society of Railway Superintendents was read requesting that delegates be appointed to attend its next convention. The report of the Committee on Standard Tests for Locomotives was called for, and the Chairman, Mr. J. N. Lauder, stated that the committee had no report to make, the reason being that a committee upon the same subject had been appointed by the Society of Mechanical Engineers, and a joint session and report was desirable. He asked to have the committee continued and authorized to confer with the Committee of the Society of Mechanical Engineers and tender a joint report at next convention. On motion the request was granted. The report of the Committee on Compound Locomotives was then read by Mr. Geo. Gibbs.

Compound Locomotives.

At the Convention of 1890 a committee appointed by your Association presented an able report on the general subject of compound locomotives. At that time it was impossible to obtain results from competitive trials of the compound and simple engine types, from the standpoint of American practice, for the reason that the former type was practically unknown here. Since then the business enterprise of one firm of locomotive builders, notably, has popularized the compound engine, so that a consideration of its features has emerged from the domain of a matter of scientific interest merely to one of great practical importance, and master mechanics everywhere will shortly be called upon to decide upon the desirability of the new type in ordering additional equipment.

Under these circumstances your committee felt disinclined to present a theoretical discussion of the subject, or an attempt at generalization from the incomplete data of trials of the type, which might be accessible from published reports. It was considered very desirable to present, rather, results of tests made under comparative conditions and with full personal knowledge of the facts; these tests to be carried out in a true scientific spirit and without any attempt to establish previously formed judgments.

To carry out this programme completely has, however, proved impossible; probably another twelve months will make it practicable; but to-day the engine is still in such an early stage of development that designers are not fully prepared to furnish machines which they feel confident will fulfill all given conditions with justice to the new principle. Any results, therefore, which your committee have to offer must be taken only as clearing the way somewhat for more conclusive trials in the future.

Your committee wish to offer a word of caution here regarding locomotive tests in general. Those who expect to find that any set of tests, however complete, will give a complete history of the machine under all of the complicated conditions found in service, will be greatly disappointed. No scheme which would furnish such results has been advanced by authorities. The number of undeterminable variables entering into a road test is enormous, and the conclusion to be drawn from the determinable ones even is a most perplexing problem. Both these classes of variables are mutually dependent, and a change in any one introduces a change in the economic results of the engine performance. Probably a combination of two methods of test would furnish a conclusive basis for comparison, but unfortunately both these methods involve practical difficulties, making them almost prohibitory. The combination referred to is a shop test of the engine, where an absolutely uniform set of conditions could be maintained, and its economy as a producer of a varying amount of work determined.

These conditions of work could be made to imitate those obtained on road with all practicable train weights. To obtain the comparative economy of the locomotives as a *whole* including the boiler and engine functions, a standard set of road tests is essential. This would involve hauling successively the same special train with each engine over the same road, at the same speed, with the same crew, and with all extraneous conditions alike, and afterward repeating such tests for the entire range of train weights. It is needless to say that your committee have not been able to entertain such a programme. In absence of this scheme the best plan seemed to be an imitation of the *average service conditions* prevailing over a considerable period of time. It was assumed that if the test could be prolonged for a period of, say, one month with each engine, taking the trains as they were offered by traffic conditions, there would result an average figure for economy, which would be repeated month by month, and consequently give an idea of the economy appearing on the performance sheets.

Those present who have followed the literature of the subject are aware that designers are not fully agreed upon the best arrangement of the compounding features of a locomotive; two, three and four cylinder types have been all proposed and each has its advocates. These various types present three important consideration for discussion; First, their relative convenience and economy of first cost and repairs; second, fuel economy, starting power, etc.; third, the practicable cylinder volume ratios obtained for each and their influence on the second condition. Of course, the above is a general statement only and does not cover the entire question. The first consideration your committee feel unable to discuss, from reasons which will appear later; it was decided to confine themselves to the second, as being the main question involved in the compounding principle, and the one which would furnish some useful results in competitive tests. The third condition is partially involved in the second, and is susceptible of proof in the same way; but to carry out this plan involved a test of two of the representative types of the compound, the two and four cylinder, and in both freight and passenger service. For many reasons it was found impossible to arrange for so complete an examination of the subject, and the report following is confined (for the committee tests) to the results from the four-cylinder type in freight service. All the needed facilities for the tests were offered by the C., M. & St. P. Ry. Co., without regard to the expense or inconvenience entailed, to whom your committee wish to express their obligation, and also for the hearty co-operation of the officers of that road in working out the details with the committee. It is proper also in this place to express their indebtedness to the Baldwin Locomotive Works, who offered to meet the wishes of the committee to any extent in furnishing special types of engines for test, without charge, and gave other opportunities for a full examination of the subject, and also to the Thomson Meter Company, who furnished the two water meters used.

In the arrangements for tests it was decided to select for the running ground an example of a road through an undulating country, having moderately heavy grades to tax the hauling power of the engines, as well as level stretches where their speed capabilities could be tried.

GENERAL DESCRIPTION OF TESTS.

All tests were planned to show the relative economy of the engines under the wide variations of conditions found in everyday working, the intention being not in any way to interfere with the schedule of the trains on the time card, or the lading resulting from regular handling of the traffic offered. On March 31 preparations were completed for the tests, which were accordingly begun and continued for about seven weeks, or up to the time when data was needed for the report, giving in all 60 trips of 92 miles each. Two crews were selected to handle the engines. In order to neutralize as far as possible the "personal equation" of the men, the crews were run alternately on each engine, and the results show the handling of both the simple and compound engine with each crew.

A dynamometer car built for these tests was run directly behind the engine on each trip. The attendant in charge of the tests remained in this car and obtained the diagram of the pull at the tender drawbar, from which the foot-tons of train work done on trip were calculated.

DESCRIPTION OF LOCOMOTIVES.

The two locomotives were built by the Baldwin Locomotive Works, in 1892, from plans and specifications of the Chicago, Milwaukee & St. Paul Railway Company. The dimensions for the two engines are given in the annexed table.

	Compound, 827.		Simple, 822.
	H. P. Cyl.	L. P. Cyl.	
Diameter of cylinders	12 in.	20 in.	18 in.
Stroke of piston	26 in.	26 in.	26 in.
Valves, outside lap	7/8 in.	5/8 in.	3/4 in.
" inside "	0	0	0
" lead	1/10 in.	3/8 in.	1/10 in.
" travel in full gear	4 1/2 in.	4 1/2 in.	5 1/16 in.
Steam ports width	1 5/16 in.	1 13/16 in.	1 1/4 in.
" " diameter	9 3/4 in.		17 1/2 length.
Exhaust port, width	3 1/16 in.		3 in.
Throw of eccentrics	2 5/8 in.		2 5/8 in.
Length of eccentric rods	4 ft 8 3/4 in.		4 ft. 8 3/4 in.
Firebox, size inside	6 ft. 6 in. × 2 ft. 10 in.		6 ft. 6 in. × 2 ft. 10 in.
" depth	6 ft. 5 in.		6 ft. 5 in.
Grate area			
Tubes, length (between sheets)	18.4 sq. ft.		18.4 sq. ft.
	13 ft. 7 1/2 in.		13 ft. 7 1/2 in.
Tubes, diameter outside	2 1/4 in.		2 1/4 in.
" number	191		191
Diameter of smokestack	16 in.		16 in.
" " drivers			
Exhaust nozzle, kind and diameter	5 ft. 2 in.		5 ft. 2 in.
	3 3/4 in. double.		3 3/4 in. double.
Heating surface, tubes	1,576.6 sq. ft.		1,576.6 sq. ft.
" " firebox	135.5 sq. ft.		136.5 sq. ft
" " total	1,712.1 sq. ft.		1,712.1 sq. ft.
Ratio heating surface to grate	9.3 to 1		9.3 to 1
Weight on drivers	87,970 lbs.		86,200 lbs.
" " truck	34,430 lbs.		33,800 lbs.
Total weight in working order	122,400 lbs.		120,000 lbs.

In working the engines it soon became evident that the compound at 180 pounds pressure was not as powerful a machine as a simple engine at the same pressure. The Baldwin Locomotive Works, when informed of this, stated that they had built the compound to carry 200 pounds, clearly a misunderstanding of the Committee's wishes in the matter, which were to have all the conditions as far as possible identical. The test records will show that the Committee have attempted to remedy this unfortunate mistake by running both engines at 180 and 200 pounds pressure alternately. The simple engine, however, does not derive the full benefit of this increased pressure, and could not be worked with it successfully on account of trouble with the valves running dry. In the "compound" this defect did not appear, as the piston-valve used is very perfectly balanced.

The trains consisted of mixed classes of "freights" in both directions, the west-bound trips having a larger proportion of light-loaded cars and empties than the east-bound, where compact and heavy trains were furnished.

The special features of the tests are described in detail under the following sub-headings:

Dynamometer Car.—This car was built for the purpose of these tests, being somewhat modified from plans kindly furnished by the Chicago, Burlington & Quincy Railroad Company. The apparatus contained in the car consists of the well-known arrangement of recording apparatus, which measures continuously the compression of the draft springs and traces the same by a pen in contact with a continuous roll of paper, which is kept in movement by a geared connection to the car axle. The car wheels imparting motion to this apparatus were turned with a cylindrical bearing surface on the rails, so that the speed of rotation of paper on the registering drums was exactly proportional to that of the car, irrespective of end-play of the axles.

The speed of train was obtained by means of another pen, attached to the armature of an electromagnet and drawing a line on the paper; at intervals of five seconds impulses were sent through this magnet from an electric contact on a clock, and caused the pen to jog inward and make a dash at right angles to the straight line; the distance between these five-second dashes, measured in sixtieths of an inch, gave the speed of car in miles per hour.

The location of mile-posts, stations, etc., on the diagram was obtained by means of another pen, similarly connected to a magnet and caused to make a jog in the line when the attendant pressed a push-button at the window. The position of the reverse lever in cab was registered on the diagram in car in the same manner, by pressing push-button giving connection with the cab by a cable. When indicator cards were taken, an additional marking pen was adjusted on the paper, and was arranged to give a mark when electric contact was made at the indicator in taking a card.

The number of strokes made by the air pump was registered in dynamometer car by means of electric impulses sent from the contact apparatus attached to the locomotive air brake pump. This recording device is substantially a clock movement, in which the balance wheel or pendulum has been removed, and the escapement operated by the pull of a magnet armature; movement of this escapement turned the hour and minute hands, and the number of double strokes of air pump were in this way measured by reading off the differences in time registered during the trip, multiplying the same by movement of hands for one stroke. The amount of steam (or water) consumed per stroke was taken as one-tenth pound, a figure determined by experiment and kindly furnished by the Westinghouse Air Brake Company. This figure is somewhat less than the actual weight of one cylinder full of steam at given boiler pressure, which fact is accounted for by wire drawing in passages, etc.

Further communication between locomotive cab and dynamometer car was established by an electric bell and speaking tube.

Measurement of Fuel.—The arrangements for determining the total amount of coal shoveled into the firebox during the trip were very complete.

About ten gunny-sacks were filled with dry coal to an accurate weight of 250 pounds each. These were stacked in the rear part of the tender, to be used only when the loose coal was exhausted. The tender was then filled with coal to an amount which was closely figured to the requirements of the trip. This coal was weighed by the barrow-full on a platform scale and dumped into a chute, from which it was loaded on the tender. This method removes the point of greatest inaccuracy, incident to the ordinary method of weighing the tender entire. The weighed coal was not allowed to be touched until the moment of beginning the test proper, that is, at the time of leaving the terminus with the train. Coal for firing up in roundhouse and making up train was taken from extra bags provided for the purpose. In starting the fire was brought up to a predetermined standard height in box, from the unweighed coal, and at the end of the run was left in same condition with *weighed* coal. After a few trips it was found possible to gauge quite closely the amount of loose coal needed for the trip, the aim being to use as few of the weighed bags as possible and yet to have little loose coal to weigh off the tender at the end.

Measurement of Water.—The feed-water used was determined by means of two Thomson water meters, one attached to each side of the engine, in the suction pipes of the injectors. Check valves were introduced between the meters and injectors, to prevent hot water blowing back and injuring the hard-rubber recording disks of the meters. The number of cubic feet of water used was read on the dials. In addition to the meters, a tank-float was also used as a check; but after a number of trips its continued use was abandoned, as it could not compare in accuracy with the meter readings, and was of value only as a rough check. The meter readings were taken just before starting from terminus with train and immediately after arriving, the water level in boiler, as read on gauge glass, being in both cases brought to standard, when engine stood on level track.

In taking indicator diagrams, the boiler pressure was observed in the usual manner by an attendant in the cab.

Measurement of Dryness of Steam.—For this purpose a calorimeter was used on four trips; no record, was, however, taken on the remaining trips. The instrument was a copy of one devised by Mr. Barnes, and described fully by him in the *Railroad Gazette* of Nov. 27, 1891. It was attached at the rear of the steam dome, and designed to show the priming at the point where the steam enters the throttle valve. Probably a better location would be in the steam pipes at the cylinder saddle, where the quality of the steam supplied at the main valves would be indicated.

Measurement of Injector Overflow.—For this figure, injector was put on for a number of times, say fifty, and the overflow caught and waste per time averaged. Improved Sellers injectors were used, and the overflow from these was found to be not only a quite constant quantity, but was much less than from the old Sellers pattern. Deductions from this loss were, of course, made from the water record of the meters.

Measurement of Waste at Pop-Valves.— Two three-inch pops were used on the dome. The waste from these when blowing off was found to be a surprisingly large quantity. Its amount was determined by causing the valves to pop for ten minutes and taking measure of the water used. In order to keep steam pressure up for this purpose, the engine was fired up and blown by an extra blower pipe led into front end from stationary boiler. The locomotive boiler was first filled to standard height on gauge glass, and after test refilled through the meter. The quantity blown off as above was found to be not less than three boiler gauges, giving an average of 168 pounds water or steam wasted per minute popping.

Indicator Diagrams.—Four trips were made on which diagrams were taken; a large number were obtained with both engines working in all positions of reverse lever, throttle and speed; also at all prominent changes of physical conditions of the road.

Persons Employed on Tests.—The Chairman of your Committee had general charge of the arrangements for the tests. Mr. W. H. Elliott, assistant to M. E. of C., M. & St. P. Railway, had general charge on the road and ran the dynamometer car records. Messrs. William and George Mason, assistants in mechanical department of C., M. & St. P. Railway, ran each a round trip in turn on the engines, keeping the log of the trip, including the coal and water measurements, cab observations, description of the train, weight of cars, etc. Mr. F. L. Allcott, in charge of the C., M. & St. P. Test Room, was clerk of the tests, keeping and tabulating all records as fast as received. A large force in the drafting room was engaged in working up the dynamometer car records and checking the results. These last records constituted the most arduous portion of the work, which may be readily seen when it is considered that 60 trips of 100 feet of record paper each had to be measured up with a planimeter and foot-tons of work and other data deduced therefrom.

Manipulation of the Engines.—No attempt was made to interfere with the usual manner of handling the trains; the usual number of delays on road were encountered and engines were worked to make up lost time when possible, as is customary in every day practice. An attempt was made—and successfully—to select for the crews careful and observing men, who ran their machines with method and intelligence. No better proof of this was needed than an examination of the economical results shown on tables, and the carefulness of the firing evidenced by examination of the steam pressure diagrams and time of blowing steam at pop-valves. In many trips the boiler pressure was well kept up to the maximum, and yet *no* steam was blown off, an extraordinary record in freight service, considering that the engines were for long periods worked to their full steaming capacity and immediately shut off for equally long periods running down hill or standing on side tracks.

OBSERVATIONS ON ACCURACY OF DATA.

Condition of the Locomotives.—After receiving the new engines from the builders, they were overhauled in the railway company's shops and run for sufficient length of time to thoroughly break them in for service. The boilers were calked so as to be practically tight, and the valve motion run over to equalize the cut-offs and insure the tightness of the valves. As soon as any leaks or imperfections were noticed, resulting from service, they were remedied. The boilers were, of course, at the start free from scale, and were run for sufficient time to get rid of the oil which might cause priming. Boiler compound was used during the test, according to the standard St. Paul Railway practice, to prevent scaling, and engines were partially blown off at the end of each trip to get rid of accumulated mud, and were washed out every 10 days. By this means the boilers were kept free from scale and steaming qualities unimpaired. The compound engine gave considerable trouble from slight leakage at the piston rod glands, but the amount of steam lost from this cause was not considerable.

The report discusses here, at considerable length, the question of accuracy in the method of ascertaining the weights of trains, measuring fuel, water, dryness of steam, smokebox temperature, accuracy of dynamometer car record and insulation of indicator piping. From these remarks it appears that the calorimeter readings, taken on four trips, indicated a somewhat constant percentage of moisture in the steam from each engine of about 1.25 per cent.

The pyrometer showed the temperature in smokebox to reach at times as high as 800 degrees in case of simple engine, and 820 degrees in compound engine. The ordinary running temperature averaged about 600 degrees.

TABULATION OF DATA.

These have been collected in the form which seemed most convenient for reference. Getting out the series of tables presented here involved much more labor and loss of time than anticipated, and after the entire time at their disposal had been exhausted, your committee discovered many places where an improved arrangement was possible and also where

additional deductions would prove useful in explaining obscure points.

Table III. is intended to give at a glance the general average economy shown by the two engines, as well as the important data effecting economy. These averages have been separated into sub-headings as follows :

1st. The west and eastbound trips with each kind of coal.

2d. The two engines at different boiler pressures, viz.: The first line of table gives averages of all westbound trips for engine 822, running at 180 lbs. boiler pressure. The figures for getting at the relative performance of the two engines will be found in columns 10 to 16. Columns 10 and 11 give these figures in the terms ordinarily obtained in locomotive tests, that is, coal and water per ton-mile. Columns 13 and 14 give results on the more exact basis of work done on train, and is the preferred one by your committee. At the bottom of table will be found a bracketed set of results for engine 827; these were from four trips made each way the first week of the test. They give an erroneous idea of the economy of the engine, for the reason that it was handled improperly during this time. This will be evident when it is seen that the starting-valve was open on these trips from one-quarter to one-third of the entire distance run. According to instructions, the men had been taught to work the engine much the same way as a simple engine, that is, at as short a point of cut-off as possible. Failing to get sufficient power to do the work under these conditions, the starting-valve was used. On explanation from Mr. Vauclain, the method of handling the engine was radically changed, the reverse-lever being dropped toward the corner as the train requirements increased, and the starting-valve only used in the corner, and as a last resort. Although these first trips cannot be taken in estimating the general performance of the compound engine, it was thought a useful purpose would be subserved by showing them in separate form in the tables; they clearly demonstrate the nice working conditions for which economy in compound engines depends, and also the poor results which may be obtained by a careless engineer. As the result of this experience and further observation, your committee are of opinion that it is advisable to make some modification in the starting-valve rigging; as now arranged, it may be opened for any distance while running and when reverse lever is in any notch; it would seem preferable to arrange so that it can be only opened when reverse lever is in corner, and that when the same is hooked up the starting-valve will be shut.

Table VII. is a compilation of the train and dynamometer results, given on Table No. 3, and is expressed in percentages of saving for the compound engine over the simple. The conditions of running trips are separated into west and eastbound, respectively, with the two kinds of coal and with the two different boiler pressures; additional comparisons of the two engines are given at unlike boiler pressures, and of same engine at unlike pressures.

(To be continued.)

TABLE III.

C., M. & ST. P. RY.—LOCOMOTIVE TESTS.—TABLE OF GENERAL AVERAGES.

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
								Train results.		Dynamometer results.					
	Weight of train, exclusive of engine.	Train ton-miles, including engine.	Time on road.	Time running.	Time working steam.	Speed trip.	Speed, excluding stops.	Coal per ton-mile.	Water per ton-mile from and at 212 deg.	Total foot tons.	Foot tons per lb. of coal.	Foot tons per lb. of water at 212 deg.	Coal per horse power per hour.	Water per horse power per hour from and at 212 deg.	No. of trips.
Westbound, Braceville coal:.....															
Eng. 822, B. P.- 180 lbs.....	448	50,144	6.45	3.95	3.40	15.1	23.5	.151	1.06	1,516,194	199.1	29.65	5.03	34.51	9
Eng. 827, B. P.—180 lbs.....	43)	46,226	6.29	3.44	2.80	15.6	26.7	.150	.97	1,362,694	220.8	31.49	4.52	32.35	4
Eng. 827, B. P.—200 lbs.....	552	59,567	5.63	3.90	3.32	16.3	23.6	.120	.79	1,807,518	257.0	38.89	3 88	25.64	6
Eastbound, Braceville coal:															
Eng. 822, B. P.—180 lbs.....	748	77,602	5.94	4.22	3.19	16.8	22.3	.104	.68	1,689,999	209.4	32.26	4.74	30.80	8
Eng. 827, B. P.—180 lbs.....	743	77,167	6.10	3.97	3.18	15.6	23.2	.086	.61	1,671,990	252.9	35.53	3.92	27.91	3
Eng. 827, B. P.—200 lbs.....	798	82,158	5.49	3.99	2.99	16.8	23.1	.088	.59	1,830,063	253.7	37.79	3.91	26.25	6
Westbound, Pittsburgh coal:.....															
Eng. 822, B. P.—180 lbs.....	615	65,377	5.12	4.05	3.63	17.9	22.6	.102	.85	1,875,060	280.9	33.92	3.52	29.19	1
Eng. 822, B. P.—200 lbs.....	521	56,830	5.61	4.10	3.50	16.3	22.3	.088	.80	1,527,224	302.8	33.32	3.30	29.96	3
Eng. 827, B. P.—180 lbs.....	731	76,034	5.35	4.40	3.85	17.1	20.8	.097	.79	2,102,375	283.9	35.07	3.48	28.23	1
Eng. 827, B. P.—200 lbs.....	583	62,551	5.28	3.54	3.06	18.0	25.9	.084	.75	1,647,338	320.5	35.87	3.10	27.70	3
Eastbound, Pittsburgh coal:.....															
Eng. 822, B. P.—180 lbs.....	719	74,984	4.85	3.75	2.92	18.9	24.4	.073	.58	1,502,094	273.0	34.28	3.63	28.88	1
Eng. 822, B. P.—200 lbs.....	694	72,396	6.46	3.68	2.97	15.0	25.1	.087	.73	1,569,353	273.0	32.74	3.64	30.48	3
Eng. 827, B. P.—200 lbs.....	754	78,169	6.62	3.79	2.91	13.8	23.8	.073	.61	1,713,392	300.3	35.93	3.30	27.64	4
First trips. Westbound, Braceville coal: Eng. 827, B. P.—180 lbs..	600	64,029	5.86	4.36	3.75	15.7	21.0	.131	.90	1,813,090	216.0	31 49	4.59	31.45	4
First trips. Eastbound, Braceville coal: Eng. 827, B. P.—18' lbs..	742	77,034	6.72	4.54	3 20	13.8	20.4	.098	.66	1,612,986	215.8	31.91	4.61	31.04	4

TABLE VII.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY — LOCOMOTIVE TESTS.

Table of Percentages of Saving by Use of Compound Engine.

Conditions.	Line No.	Train results. Coal per ton-mile.	Train results. W't'r per ton-mile.	Dynamometer results. Foot-tons per lb coal.	Foot-tons per lb w ter	Coal per h. p. per hour.	W't'r per h. p. per hour.
Column No.....	1	2	3	4	5	6	7
Braceville Coal:							
Westbound.							
180 lbs. { 822	2						
180 lbs. { 827	3	0.66	8.5	10.9	6.2	10.1	6.3
200 lbs. { 822	4						
200 lbs. { 827	5						
Eng. 822 @ 180 lbs..... } Eng. 827 @ 200 lbs. .... }	6 7	20.5	25.5	29.1	31.2	22.9	25.7
Eng. 827 @ 180 lbs..... } " " @ 200 lbs..... }	8 9	20.0	18.5	10.7	23.5	14.0	20.7
All trips.....	10	10.6	17.0	20.0	18.7	16.5	16.0
East-bound.							
180 lbs. { 822	11						
180 lbs. { 827	12	17.3	10.3	20.8	10.1	17.3	9.1
200 lbs. { 822	13						
200 lbs. { 827	14						
Eng. 822 @ 180 lbs..... } Eng. 827 @ 200 lbs..... }	15 16	15.4	13.2	21.2	17.1	17.5	14.8
Eng. 827 @ 180 lbs..... } " " @ 200 lbs..... }	17 18	2.3	4.9	3 2	6.3	0.0	6.0
All trips.....	19	16.3	11.8	21.0	13.6	17.4	12.1
All Trips—East and West.....	20	13.0	14.9	20.5	16.1	16.9	14.1
Pittsburgh Coal.							
Westbound.							
180 lbs. { 822	21						
180 lbs. { 827	22	4.9	7.1	1.1	3.4	1.1	3.3
200 lbs. { 822	23						
200 lbs. { 827	24	4.6	6.2	5.8	7.6	6.1	7.5
Eng. 822 @ 180 lbs..... } Eng. 827 @ 200 lbs..... }	25 26	17.6	11.8	14 1	5.7	11.9	5.1
Eng. 822 @ 200 lbs.... } Eng. 827 @ 180 lbs..... }	27 28	—10.2	1.0	—6.2	5.3	—5.5	5.8
Eng. 822 @ 180 lbs..... } " " @ 200 lbs..... }	29 30	13.7	6.0	7.8	—1.7	6.2	—3.4
Eng. 827 @ 180 lbs..... } " " @ 200 lbs..... }	31 32	13.4	5.0	12.9	2.3	10.8	1 8
All trips.....	33	4.7	6.7	3.6	5.5	3.5	5.4
Eastbound.							
180 lbs. { 822	34						
180 lbs. { 827	35						
200 lbs. { 822	36						
200 lbs. { 827	37	16.1	16.4	10.0	9.6	9.3	9.3
Eng. 822 @ 180 lbs..... } Eng. 827 @ 200 lbs..... }	38 39	0.0	—5.2	10.0	4.7	9.1	4.3
Eng. 822 @ 200 lbs . (Eng. 827 @ 180 lbs..... (	40 41						
Eng. 822 @ 180 lbs..... } " " @ 200 lbs..... }	42 43	—19.2	—26.0	0.0	—7.3	0.0	—5.5
Eng. 827 @ 180 lbs..... } " " @ 200 lbs..... }	44 45						
All trips.....	46	8.7	6.1	10.0	7.2	9.2	6.9
All trips—East and West.....	47	3.2	3.1	6.8	6.1	6.5	6.0

On June 17 the House Committee on Interstate and Foreign Commerce authorized Mr. O'Neill, of Missouri, to report favorably a bill to promote the safety of railway employés aud passengers. It requires locomotives to be equipped with power brakes sufficient to control a train. Every new locomotive after July, 1893, must be equipped; and after July, 1895, all locomotives. After July, 1895, all new cars, or old cars sent to the shops for repairs, must be equipped with automatic couplers, and after July, 1898, all cars must be so equipped. After July, 1895, all new cars (and after July, 1898, all cars) must be provided with continuous brakes to be operated by the locomotive. In July, 1893, every common carrier shall file with the Interstate Commerce Commission a statement stating the automatic coupler which it prefers. If any coupler receives 75 per cent. of the votes it shall be adopted as the standard automatic coupler. If no coupler receives this percentage the Commission shall within six months designate a standard automatic coupler.

It is stated that Baltimore is to have an elevated railroad. The Roland Park Elevated Railway Company has been organized with Samuel M. Jarvis as President, and it is stated that contracts for building the line are to be closed soon.

A collision occurred June 9 on the Ilkley branch of the Midland Railway, near Guisely, in Yorkshire, England. Two trains, through some misunderstanding of the signals, crashed together and were badly wrecked. Five persons were killed and 20 seriously injured.

The consumption of coal in Paris is subject to very severe supervision in order to prevent the production of smoke The importation of coal is retarded by a considerable impost, and that of wood and coke is encouraged. For this reason soft coal is little consumed in the gay capital.

An English Brake Instruction Car.

An instruction car is being used on the Northwestern railway, of England, for the purpose of explaining to the employés the principle and operation of the brake appliances. The car is carried on four wheels, and the inside dimensions are as follows: Length, 19 feet 6 inches; width, 7 feet 3½ inches; height, from floor to center of roof, 7 feet 2 inches. Inside the car are 11 brake cylinders placed in a vertical position, with reservoirs and triple valves attached, occupying a space 9 feet 6 inches by 4 feet 8 inches in the middle of the floor. The pistons of the cylinders are weighted by springs representing the pressure of the brake shoes against the wheels. Around this group of cylinders, and covered by flooring, are coils of iron pipes, connected at intervals by 10 hose couplings which are coupled together in pairs at one end of the car. The total length of these pipes and hose couplings is equal in length to a train of 11 cars. Supported on brackets placed at one end of the car are a triple valve, cylinder, governor, donkey pump and engineer's valve, cut in section and used for illustrating the working of the brake.

American Society of Mechanical Engineers.

The summer meeting of this Association was held in San Francisco May 16 to 19 inclusive, and was attended by 75 members. The headquarters were established at the Palace Hotel, and the sessions were held in the hall of the Academy of Sciences.

Papers upon the following subjects were presented: Two-Cylinder Versus Multi-Cylinder Engines; Summary of Results of Principal Experimental Measurements of Performance of Refrigerating Machines: An Experiment with Aluminum; A Novel Fly Wheel; The Elastic Curve and Treatment of Structural Steel; Machine Molding; Steam Distribution in a form of Single-Acting Compound Engine; The Measurement of Power; Autographic Recording; Apparatus for Use in the Testing of Materials; A Self-Lubricating Fibre-Graphite for the Bearings of Machinery; The Utilization of the Power of Ocean Waves; An Experimental Locomotive; The Density of Water at Different Temperatures; Notes on a Problem in Water Power; On Compounding Centrifugal and Load Governing by a Rotary-Piston Valve; The Electric Railway as Applied to Steam Roads; Economy and Efficiency of the Steam Engine; Preliminary Report on a Standard Method of Conducting Locomotive Tests.

One day was spent in an excursion around the bay, visiting Mare Island Navy Yard and other points of interest; one day was devoted to an excursion to the Crystal Springs reservoir, and one day was spent in a visit to Sutro Heights, and in visiting several manufacturing works.

Corridor Train, Great Western Railway.

The Great Western Railway of England has recently introduced a passenger train consisting of the "corridor" type of cars. These cars are similar to those used on the Great Northern Railway for the last two years, except that the Great Northern has gone a step further and established communication between the cars of the train by a vestibule connection. Passengers will not be allowed, however, the liberty of passing through the train, as the doors leading to the vestibule are to be kept closed and locked while running, possibly to prevent accidents or third-class travelers from occupying first-class compartments.

The new train consists of a guard's van and four passenger coaches, each of the latter being 50 feet in length, while the guard's van is 40 feet in length. Two of the passenger coaches are designed for third-class passengers, one for second-class and one for first-class; but the general design of the coaches is the same. They are 9 feet in width, and each includes a smoking and a baggage compartment. There is a corridor along the side, terminating in the vestibule connection. A comfortable improvement over the ordinary English coach are the toilet rooms, which are provided in each coach; the gentlemen's room being at one end and that for the ladies at the other. The smoking saloon is the size of two compartments, but the seats are arranged on either side of an aisle leading through the middle.

Beyond this are four apartments of the ordinary shape and size, except that they are narrower, to allow the passageway on one side. The first-class compartment is upholstered in morocco and broadcloth, while the second and third, though finished in a cheaper material, are nearly, if not quite, as comfortable as the first-class. In this new train certain characteristics of the old type of coach have been continued. The passenger will find on one side the usual door opening directly to the outer air, while opposite there is an outside door in the corridor.

The privacy of the compartment system is maintained, but communication with the guard's van is established throughout the train by a system of electric bells similar to that in use on American sleeping cars.

The train is warmed by steam taken from the locomotive, and illuminated by compressed gas lamps situated in the clear story of the cars.

The hardest known wood is said to be cocus wood, and that it turns the edge of any axe, however well tempered.

The Missouri Pacific intends to build a $25,000 brick office building in Kansas City for the use of officials having their headquarters at that point.

The Milburn, N. J., station of the Delaware, Lackawanna and Western Railroad and the coal yard adjoining it were totally destroyed by fire recently.

A relief map showing San Francisco, San Mateo, Santa Clara and Santa Cruz counties, Cal., is being prepared at an expense of $10,000 for exhibition at the World's Fair.

One of the most interesting of the many entertainments that were given at Saratoga at the recent conventions of the Master Car Builders' and Master Mechanics' Associations was the lecture given by Prof. E. L. Elmendorf, son of Mr. J. A. Elmendorf, of the firm of Edward Smith & Co., of New York, entitled "A Trip to Europe," illustrated by 132 pictures shown through a stereopticon; it represented a six weeks' trip taken recently by the Professor, commencing in Holland, then up the Rhine as far as Mainz, from there to Heidelberg, Nuremberg, Lindau on Lake Constance, Landeck in the Austrian Tyrol, crossing the Alps seven times.

Convention of the Master Car Builders' Association.

The twenty sixth annual convention of the M. C. B. Association met in the ball room of Congress Hall Hotel, Saratogo, June, 15 at 10:20 A. M. President John Kirby occupied the chair. Ninety-eight members and about 150 visitors, many of whom were ladies, attended the opening ceremonies. Mr. Mitchell, President of the Village of Saratoga, gave a hearty and somewhat humorous address of welcome which excited considerable merriment and enthusiasm among those present.

President Kirby's annual address, which was then delivered, was in a serious strain prompted, perhaps, by his contemplated final withdrawal from the office of President of the Association which he has filled with great credit to himself and satisfaction to the members.

The report of the Secretary, Mr. John W. Cloud, showed that the Association now had 298 members, and that at the present time 1,071,219 cars are represented by the Association, of which 11,580 cars are represented by appointments from railroad companies not heretofore represented, and the balance, 1,059,639 cars, by the old representative membership, or an increase of 68,075 cars represented by the old membership, and a total increase of 79,655 cars represented.

The Treasurer's report showed a balance on hand of over $4,000, and no unpaid accounts.

The reports of committees were then taken up. The first called for was that of the committee on joint inspection, and it was read by Mr. A. M. Waitt. We give an abstract of it herewith.

Joint Inspection.

The increasing number of disputes which is brought before the Arbitration Committee each year testifies to the fact that serious differences in the understanding of the Rules exist even among those of great intelligence and experience who have charge of our mechanical departments.

Your Committee would not for a moment pretend that it can eradicate this trouble, but it does believe from the sentiments expressed by the heads of the mechanical departments of over 60 different roads, in answer to our circular of inquiry, that there is, with regard to many of the rules, a sentiment clearly enough defined to embody it in the rules as an essential part of them, and thereby enable the Car Inspectors of all grades in the country to have before them, more in detail, the majority decision as to the meaning of many disputed points.

What is needed to greatly facilitate the speedy movement of through freight is some means of having, as nearly as possible, uniformity of inspection at various interchange points, even though they may be hundreds of miles from each other.

It is without question clearer and more productive of uniformity and freedom from disputes to give definite limitations, rather than the old way of saying cars may be refused with "brakes in bad order," leaving it for each different inspector to define what, in his judgment, is bad order in the brakes, resulting in one inspector passing a car without card and the next one requiring a card for an alleged defect which the first man did not think wrong to pass, and at a third point the car is possibly refused absolutely as unsafe, and all this on account of a difference in opinion as to the number of bolts required for safety in a brake-step bracket or a brake-shaft step. How much better to have it distinctly understood at all points what is recognized as the proper limit at which to draw the line.

Among many recommended changes in the Rules of Interchange the committee submitted the following:

Rule 3, section (*u*), paragraph 1, to read, "M. C. B. couplers with such minor defects only as do not impair their efficiency and safety. The following defects will not be considered as impairing the efficiency or safety of M. C. B. couplers:"

A. Chipped to 1⅛ inches vertically and 2½ inches horizontally from outer edge of guard arm, provided not less than 5 inches of metal is left intact on outer edge of guard arm at *A*. See Fig. 1.

B. Chipped to 2½ inches vertically and 1 inch horizontally in the center of guard arm, provided both top and bottom corners are perfect. See Fig. 2.

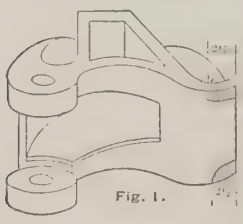


Fig. 1.

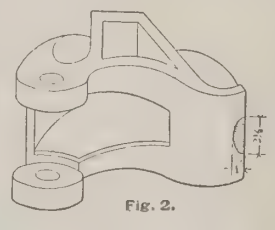


Fig. 2.

C. Chipped on side wall to 3 inches vertically and 1½ inches horizontally, as shown in Fig. 3.

D. Chipped on front wall or center front face to 3 inches horizontally and ¾ inch vertically in top, bottom and throat as shown in Fig. 4.

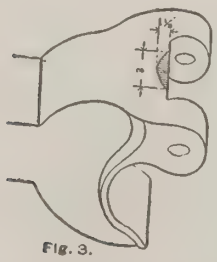


Fig. 3.

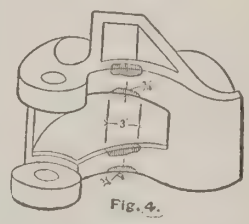


Fig. 4.

E. Chipped on lugs in which knuckle swings to ½ inch vertically, ¾ inch back and 3 inches transversely, as shown in Fig. 5.

F. Having combination of chipped places within limits given above, as shown in Figs. 6 and 7, provided that defects shown in Figs. 1 and 2 do not together exist in the same coupler.

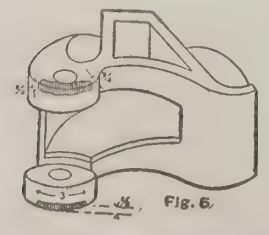


Fig. 5.

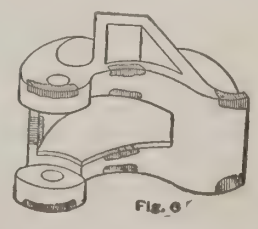


Fig. 6.

G. Having rib in front of locking dog bent inward, provided rib is chipped off so as to allow dog to drop into position.

H. Knuckles with lugs chipped to ¾ inch vertically and ¾ inch horizontally at *A B C D*. See Fig. 8. These defects in knuckles are safe, but should be carded for.

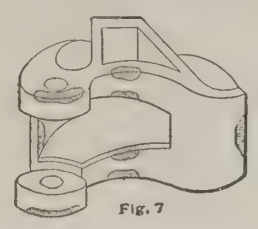


Fig. 7

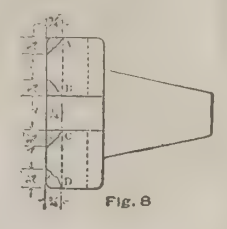


Fig. 8

F. D. ADAMS, J. T. CHAMBERLIN, A. M. WAITT, WILLIAM GARSTANG, D. W. HUNTER, H. C. MCCARTY, JOSEPH TOWNSEND, Committee.

The changes recommended by the committee in Rule 3 were adopted.

The report was received, and discussion postponed until the discussion on the Rules of Interchange should come up.

The subject of expenses of the arbitration committee was taken up and after some discussion it was voted that the Association would bear the expenses of the arbitration committee and those of the executive committee incurred at their meetings held during the year.

After some warm discussion a resolution was adopted that the value of the body and destroyed trucks of cars shall be determined by the respective age of the body and trucks in accordance with the rules.

The business of the afternoon session was begun by the reading of the report on Air Brake and Signal Instructions.

Air Brake and Signal Instructions.

Your committee returns to you herewith the air brake and signal instructions which were submitted to us for revision. We have made a considerable number of alterations in the work of last year's committee, which was presented at the last convention. In making these changes we have been aided by the discussion of these rules by the various railroad clubs in different portions of the country. We have given careful consideration to all the various points suggested by the different clubs, and have embodied in these rules such of their suggestions as seemed to be desirable.

There is one point which has been the subject of much discussion by the clubs, which your committee has concluded to let stand as it was recommended last year. This is the question of the limits of the stroke of the air brake piston at the time that the adjustment of the brake is made.

The recommendation of the committee last year was that in taking up the brakeshoe slack the adjustment must be so made that the piston should travel not less than four nor more than eight inches. In view of the wide difference of opinion upon this point, we feel called upon to state our reasons for having made no change in this respect.

There may be said to be two principal objections to this rule: one is, that if inspectors are allowed in making adjustment to take up the slack so closely upon any cars that the piston will travel but four inches, the conditions may be such that in the same train there may be brakes having a piston travel of but four inches, and others having a piston travel of nearly 12 inches, and it is well known that the piston pressure in such cases will vary considerably. As the auxiliary reservoir pressure is the same as the piston pressure under a full application of the brakes, the auxiliary reservoir pressures will therefore vary considerably where some pistons travel but four inches and others 12 inches, and, therefore, some brakes will be more difficult to release than others. This criticism is recognized by the committee to be entirely valid, and has been given careful weight.

The other objection is, that in cases where the brakes are hung low and suspended from the truck bolster, or from the car body, the adjustment of the brake gear might be made upon a loaded car and the piston travel reduced to four inches. The unloading of such a car, and the consequent raising of the bolster on the springs before the shoes have become much worn, would be liable to cause the brakes to drag upon the wheels constantly. In regard to this criticism your committee has but one reply to make, which is, that it is now so generally recognized that these methods of hanging the brakes are bad ones, and they are being so generally abandoned, that this criticism should have but little weight.

On the other hand, in favor of the four-inch limit, is the consideration that freight trains generally are required to run long distances, with no opportunity for adjustment of brake shoe slack in the interval. Upon railroads where long runs over an undulating country are necessary it is of the highest importance that an adjustment of the piston travel should be made in the outset which will permit the brakes to remain effective through the whole run. We are assured by those who have had experience in hauling air-braked freight trains for some years over their roads that an adjustment of the piston travel to only six inches would not render the brakes serviceable throughout the runs.

Your committee has given full consideration to these various views of the question, and, in the face of such testimony as has been presented we do not feel warranted in altering the recommendation of the committee of last year. If any alteration had been made by this committee it would have been to reduce the 8-inch limit to 7 inches, and we believe that this would be an advantageous change. Since, however, the brake beam and the brake gear upon a great many freight cars are so light that an adjustment of less than 8 inches would tend to cause the shoes to drag upon the wheels when the brakes are released, we did not feel warranted in recommending this change.

Your committee desires to emphasize the recommendation of the committee of last year in regard to the use of a metallic brake beam. It is gratifying to note that very few air-braked cars are being constructed now with other brake gear than that adopted by this association as standard. The majority of air brake cars are also being equipped with a metallic brake beam.

It is in a high degree essential to the proper operation and maintenance of airbrakes in interchange that these standards of the association be followed, and it can hardly be doubted that their use is, in the end, an economical measure.

When the construction of a freight brake gear has become uniform in these respects it is probable that advantageous changes may be made in the rules relating to adjustment and inspection; but at the present time your committee can only recommend that the rules and instructions as now presented should be put into force and that the experience of carrying them out be depended upon for future changes.

E. W. GRIEVES, R. D. WADE, J. L. GREATSINGER, Committee.

The form of questions and instructions as presented in the committee's report last year accompanied the above, modified in accordance with suggestions from various sources.

The chairman of the committee stated that his committee had co-operated with a similar committee of the Master Mechanics' Association and that the report was identical with the one to be presented to that Association. The importance of this matter drew out a good deal of discussion, during which a motion was put and carried that wherever mention was made in the report fixing the maximum and minimum piston travel it be made to read that the minimum be six inches and the maximum eight inches. Several other features of the report were discussed, and some referred back to the committee for further consideration.

Mr. Blackall then announced that the Delaware & Hudson Canal Company had tendered an excursion to the members of the convention to Lake George, starting on Saturday morning at 9 o'clock.

On motion the invitation was accepted and the thanks of the convention tendered to the D. & H. C. Company.

At the opening of the morning session on the second day a letter was read from the Superintendents' Association inviting the M. C. B. Association to send two or more delegates to attend the next meeting of the former society, and take part in the discussions. Messrs. Forney and Mackenzie were appointed delegates in accordance with the invitation.

The first committee report read was that on metal for brake shoes, which was simply to the effect that this committee, having the subject of a standard efficiency for airbrakes assigned to it, could not devote any time to the matter of metal for brake shoes.

The report was received, and the committee discharged.

The report of the committee on freight car truck frames was then read.

Freight Car Truck Frames.

Your committee appointed to examine into and determine the relative merits between the swing and rigid bolster trucks, also the relative merits of the Fox pressed steel truck and the Diamond truck for 60,000-pound cars now in use, beg to report as follows:

We received 43 replies to our circular, 33 of which favored the rigid over the swing bolster type of truck, 15 of the thirty-three were using the Fox pressed steel truck under from 1 to 15 cars each, and so far they had given entire satisfaction, one member having one car with this truck under for 15 months in constant service, and had not cost one cent for repairs of trucks.

All expressed themselves that the Fox truck possessed good points, but had not been long enough in use for any one to recommend it. In view of these facts your committee would recommend that this work be carried to the succeeding year, as the time required to ascertain the merits and faults of the Fox solid pressed steel truck would be considerably more than one year.

GEO. F. WILSON, W. S. MORRIS, S. A. CRONE, Committee.

The report was received, and committee continued.

The report of the committee on wheel guarantees was then read.

Wheel Guarantee.

Your committee, appointed to confer with the Association of Chilled Cast Iron Wheel Makers in the matter of specifications and guarantee for cast iron wheels, begs to present the following report:

A meeting was held on April 6, 1892, at Chicago, of the Executive Committee of the Association of Chilled Cast Iron Wheel Makers, in which the following resolution was passed:

Resolved, That when wheels are removed as failure wheels from service, for any cause whatever, where there is a doubt as to whether the wheel maker is responsible or not for the failure, if it is practicable, such wheels shall be tested by the Master Car Builder, or his representative, and if it is found that the depth and character of the chill, and the strength and character of the metal in the plates, are up to the standard specifications adopted by the Joint Conference Committee of the American Master Mechanics', Master Car Builders' and the Wheel Makers' Association, it shall be considered that failure is due to the service and not the quality of the wheel, and that the wheel maker ought not to be called upon in such cases to pay for or replace any such wheels.

Your committee feels that the resolution as passed is indefinite in its character, and is somewhat one-sided in favor of the wheel maker.

In the first place the clause, "where there is a doubt as to whether the wheel maker is responsible or not for the failure," is extremely indefinite. [That part of rule 9 of the Code of Rules referring to renewal of wheels was here quoted.]

This rule clearly specifies the defects for which the owner is responsible, or the user is responsible, as between railroads. All the defects common to wheels are enumerated here, with the exception, perhaps, of wheels failing on account of being "comby," and the defects as mentioned are carefully defined under Rule No. 3, Sections (a) to (m) inclusive. The defect called "comby" is of rather rare occurrence, being an irregular spot caused by collection of dirt or slag in the tread of the wheel.

The wheel maker certainly is not responsible for wheels "loose" or "out of gauge," although the railroad company mounting and using the wheels should be responsible.

There might also be a question as to the responsibility of the wheel maker for "burst wheels," as the bursting may have been caused by undue pressure in mounting on the axle or from bad fitting. In the case of "burst wheels" the breakage of the wheel in question and in the inspection of the strength and character of the metal in the plates might be a basis for an expert to determine the responsibility of the wheel maker, but it would be a somewhat difficult matter for Master Car Builders to determine this question satisfactory to themselves and to the maker.

With reference to the defects, "shelled out," "comby," "seams," "worn flange,' "tread worn hollow,' an inspection of the "depth and character of the chill and the strength and character of the metal in the plates" would throw no light whatever upon the subject, as there is no relation between these defects and the points referred to by the Wheel Makers' Association.

The remaining defects, mentioned in clauses from "g" to "l," inclusive [broken flange, broken rim, cracked tread, cracked plate, cracked brackets, broken in pieces], are all cases of fracture, and it is the opinion of your committee that wheel makers should, under no circumstances, be relieved from responsibility for any of the cases of breakage referred to therein.

In the matter of worn flanges, there is a serious question as to whether wheel makers should be held responsible for all cases of failure from this cause, as a portion of such failures may be due to trucks out of shape and improper fitting; at the same time, the result of our observations would seem to indicate very decidedly that the formation of worn flanges is due to a very great extent to difference in the wearing quality of the two wheels.

As recommended in a previous report, it would possibly be fair to hold wheel makers responsible for half of the failures from worn flanges. The members of the Wheel Makers' Association presented quite a number of examples of wheels which were considered subject to replacement by the railroad company, in which the defect consisted of "rough spots caused by sliding;" and it would seem from their testimony that a great many railroads do not distinguish between "rough spots formed by sliding" and "shelled out" or "comby" wheels. This certainly is not fair to the wheel maker, as the wheel is ruined by sliding, and would have been a perfectly serviceable wheel if not unfairly treated by the railroad company in this respect. Sliding a wheel frequently heats it to such an extent as to crack the brittle

white iron, causing small pieces to flake off, and this seems to be more frequently the case in well chilled wheels than in poor ones, the white iron possibly being harder.

In the opinion of your Committee wheel makers should certainly not be held responsible for this defect.

In conclusion, it is the opinion of your Committee that the resolution adopted by the Association of Chilled Cast-Iron Wheel Makers cannot be incorporated in the specifications adopted by this association, and that the only points which the Committee has to recommend for the consideration of the association, so far as changing the present specifications is concerned, is whether any allowance should be made to the wheel maker for "worn flanges." As to the wheel maker's responsibility for wheels sliding: when the sliding causes a "flaking out" on the tread, generally known as "comby from sliding," it would be impossible to incorporate this in the specifications, the matter being a question of judgment as to the cause of the spot so failing.

It would possibly make the matter more definite to change the term "flat by sliding," as used in the guarantee, to "flat by sliding or comby by sliding."

J. J. HENNESSEY, THOMAS SUTHERLAND, Committee.

The report was received and considerable discussion followed, the sense of which was that more attention is due, in justice to wheel makers, to the question of whether wheels become flat or comby from sliding or from defective casting, and that when becoming defective from the former cause railroad companies should bear the expense. The recommendation of the committee to change the term "flat by sliding" to "flat by sliding or comby by sliding" was finally ordered to letter ballot.

The report of the Arbitration Committee, and its recommendations of changes in the Rules of Interchange, together with the recommendations of the committee on joint inspection, were here taken up, in considering which and in ordering the changes agreed upon, the balance of the day was spent.

At the morning session of the third day a communication was read from the Master Car and Locomotive Painters' Association asking the assistance of the M. C. B. Association in encouraging foreman painters to join the Painters' Association and attend its meetings. The communication was acknowledged, with the assurance that the M. C. B. Association sympathized with the aims of the Master Car and Locomotive Painters' Association, and would in every way give it cordial support.

Discussing and amending the Rules of Interchange was the first business taken up. Among other changes and additions to the rules there was added to the paragraph concerning manufactured articles, in Rule 26, the following:

"When an M. C. B. coupler is changed in Canada, on defect card acknowledging wrong material, couplers may be charged at manufacturers' prices in the United States, plus the customs duties, which must be paid on entering Canada."

There was considerable talk indulged in here as to the time of meetings of the association, the general opinion prevailing that these occupied too little time to allow of proper deliberation on the subjects presented upon which action had to be taken. This resulted in an amendment to the by-laws being adopted providing that hereafter the regular time of meeting be annually on the second Tuesday in June and that the hours of session be from 9 A. M. to 1:30 P. M.

A supplementary report of the committee on airbrake and signal instructions was read. In regard to the limits of brake piston travel the committee reported:

Since it appears to many to be desirable to designate not only maximum and minimum limits of brake piston travel to guide inspectors as to the extent to which the brake shoe slack must be taken up, but also a limit to which the piston travel may be allowed to increase before an adjustment is again required, we offer for your consideration the following amendment to the clause concerning the adjustment of brakes:

"When under a full application, the brake piston travel is found to exceed eight inches upon a passenger car or nine inches upon a freight car, the brake shoe slack must be taken up and the adjustment so made that the piston shall travel not less than five nor more than six inches."

The recommendation was adopted.

The report on cast iron wheels was then read by the Secretary and formally received.

Cast Iron Wheels.

Your committee, to which was assigned the duty of inquiry as to what improvements were being made in the manufacture of cast iron wheels, begs to submit the following:

A circular was sent to wheelmakers and heads of car departments represented in the association, embracing the following eleven questions:

First: Do you use what is known as the "contracting chill" in the manufacture of cast-iron car wheels, and if so, what percentage of your product is made in such chills, and whose design of contracting chill do you use?

Second: Do your foundry or service records show that there is any advantage in using the contracting chill which is not had with the older form of fixed chills, either in percentage of loss or uniformity and quality of product? If so, please give as complete data as possible.

Third: Do you find that cheaper grades of iron may be used in wheels made in the contracting chill with as good results as with more expensive grades of iron in solid chills?

Fourth: What percentages of new iron do you find it desirable to use in making wheels in the contracting chill and in the solid chill?

Fifth: Has the percentage of guaranteed wheels, which you have been required to replace, or to have replaced, been modified by the use of the contracting chill in the manufacture of such guaranteed wheels, and to what extent?

Sixth: Do you grind or balance wheels before you ship them to the purchaser, or before you put them in service?

Seventh: In case you grind or balance the wheels, has the percentage of wheels which you have been required to replace, or to have replaced, been reduced by the grinding or balancing below what it was for wheels made in the same form of chill before they were ground or balanced, or to what extent?

Eighth: What is your wheel guarantee?

Ninth: What variations are allowed in weight and in circumference of wheels of the same nominal weight or diameter?

Tenth: How long are wheels permitted to remain in the annealing pits?

Eleventh: What do you consider the proper depth and distribution of the chill on a wheel?

Replies were received from 16 railroads and 13 wheelmakers.

First: Of the 16 roads making replies, 11 are using wheels cast in contracting chill, two in the plain chill and three made no reply to this question. Of those using the contracting chill, one used the Canda, one the Whitney and nine the Barr. Of the 13 wheelmakers, five are using and one arranging to use the Barr chill, one the Whitney, one the non-expansive chill and five the plain chill.

Second: Of those using the contracting chill and its products, all agree, with one exception, that foundry loss is decreased; some place it as high as 50 per cent. The one exception is a road that was noted for its success with cast-iron wheels before the introduction of contracting chill. It is the opinion of your committee that the evidence at hand goes to prove an advantage in this respect. As regards uniformity and quality of product, nothing definite can be said by the committee.

Third: As regards using a cheaper grade of iron with contracting chill, out of the twenty-nine answers to the circular, eleven made no reply to this question; three answered that cheaper iron might be used; one was doubtful; five answered no; seven thought it not advisable to do so, and two had no data. From the answers received and data furnished by an advocate of the chill who has experimented very elaborately, your committee is of the opinion that it not advisable or expedient to use a lower percentage of new iron for wheels made in the contracting chill than is used when made in the plain chill.

Fourth: The advocates of contracting chill say from 30 to 75 per cent of new iron should be used. Only two advocates of the plain chill reply to this question, one answers that 45 to 65 per cent. of new iron should be used and the other that 50 per cent. should be used. It is the opinion of your committee that not less than 50 per cent. of new iron should enter into the manufacture of cast wheels.

Fifth: Of the 29 answers to circular, 11 express no opinion in replying to this question, nine have no data or lack experience, three reply that there is no difference, six reply that there is a decided improvement (one says in bank account, others in less replacement). One maker has reduced these failures from $\frac{16}{100}$ to $\frac{12}{1000}$ of 1 per cent. It is clearly evident that users of cast iron wheels have not had sufficient experience to warrant a very general reply to this question, and it is one that might be a fit subject for further inquiry.

Sixth: Eight of the twenty-nine replies received failed to answer this question, which, in the opinion of your committee, is one of the most important questions; 17 grind all or part of their wheels, four neither grind nor balance their wheels. Your committee regrets that this question was not answered by every wheelmaker and user, as upon it, in our opinion, exists about the only difference of any importance, between the advocates of the contracting and plain chill.

Seventh: Answer to this question is uniform from all parties, to the effect that they have no data and not sufficient experience to answer definitely.

Eighth: We find the general guarantee is four to five years in freight service and 60,000 miles in passenger service. A very notable feature of the report is that parties advocating 25 to 40 per cent. of new iron only guarantee their wheels for three years in freight service, while those using 75 per cent. of new iron guarantee them for five years in freight service or for 70,000 miles in passenger service.

Ninth: Seven replies to the circular make no answer to this question; one allows 1 per cent. of weight and $\frac{1}{16}$ inch diameter; eight allow 2 per cent. and $\frac{1}{4}$ inch circumference; two allow 15 pounds in a 580-pound wheel and $\frac{1}{16}$ to $\frac{1}{8}$ inch diameter and from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches circumerfence; three allow 20 pounds in weight; two allow 10 pounds; one allows 5 pounds and one had no specifications. It is evident from the answers received that all did not understand this question alike, as the weights vary from 5 to 20 pounds and the circumference from 0 to $2\frac{1}{2}$ inches.

Tenth: Answers to this question are somewhat surprising. The time allowed in the annealing pit varies from three to nine days, and it seems as though a more uniform practice might be followed to good advantage, for, if three days be sufficient to properly anneal a wheel, the practice of allowing them to remain from six to nine days must be a very expensive one in the foundry, and if from six to nine days be necessary to make a good wheel the practice of annealing only three days ought to be corrected. Advocates of the maximum or minimum time are not confined to plain or contracting chill, and it appears to be either a question of opinion or circumstances.

Eleventh: Eight replies were received with no answer to this question. It appears to be generally considered that a model wheel should have $\frac{5}{8}$ chill. From the replies received the committee finds that the practice varies from $\frac{5}{8}$ to $\frac{7}{8}$ on tread and $\frac{1}{4}$ to $\frac{3}{4}$ in throat.

Your committee is indebted to Messrs. Barr, Whitney and Faught as advocates of the contracting chill, to Messrs. Griffin and Lobdell as advocates of the plain chill, and to Messrs. W. W. Snow, of the Ramapo Wheel Works, and H. J. Small, Superintendent of Motive Power of the Southern Pacific road, for valuable assistance in the shape of statements, records, photographs and prints furnished. It has been hinted by one of the plain chill wheelmakers that our questions pertain too exclusively to the contracting chill. This was far from the minds of your committee, and it is their wish that this subject be still further investigated, and a much wider scope given the plain chill men to present the benefits to be derived from adhering to their claims. A few points raised by advocates of the contracting chill will not be out of place. One of the largest makers and users of wheels says he expects decided gains by the use of the contracting chill, as wheels may be ground with safety after being slid flat, and used again on account of the extra deep chill. Another says $4\frac{1}{2}$ per cent. of wheels cast in plain chill were condemned on account of chill cracks and other defects not known in the contracting chill.

One wheel manufacturer says wheels cast in contracting chill do not vary $\frac{1}{4}$ inch in circumference, another says $\frac{3}{8}$, another says without hardening our mixture we obtain, in at least 90 per cent. of our wheels, a chill of $\frac{3}{8}$ to $\frac{1}{2}$ inch deep, uniformly all around the wheel at the root of the flange, while the same mixture if cast in the solid chill would have no chill at all or it would be very slight. It is said that specific gravity tests of white iron produced in the contracting chill show from one to three pounds greater weight per cubic foot than same iron from the plain chill.

One of the plain chill advocates makes a very forcible remark and one worthy of consideration, namely, "that the contracting chill is a much heavier one than the plain chill of five or eight years ago." His experience, which is large, confirms his belief that the plain chill of the same weight as the contracting chill, and the same material in the hands of skillful and experienced men, will produce equally as good results as the contracting chill. This is also confirmed by two other large manufacturers, who have verified statements that this experiment has been made to their entire satisfaction, and who further claim that the time between pouring and chilling the iron is very little affected by any contracting chill, and conclude by saying, "If railroads will first specify everything possible, so they can upon inspection: 1st, be sure of a safe wheel; 2d, that it will indicate sufficient chill; 3d, that it is mechanically correct and not liable to damage from riding, flange wear, etc., and ask the makers to guarantee certain mileage, and let them (the makers) provide the wheel, the railroads certainly would be getting all they could ask for."

In conclusion your committee expresses briefly the opinion, that the experiments made and being made in the distribution of metal by those connected with roads which have facilities for making experiments, places the members of our body under obligations to them, and wheelmakers are entitled to more credit than they now receive for the production of a cast-iron wheel weighing less than 600 pounds guaranteed to carry our largely increased loads, running 40 to 50 miles per hour for 60,000 miles, at a cost far below the price we pay for other parts of our car and locomotive castings. When we consider the remarkable progress in the manufacture of cast-iron wheels, and how well the makers of such wheels have kept to the front in the "wheel procession," we must admit that they are entitled to a large amount of credit.

GEO. W. WEST, W. H. THOMAS, JOHN PLAYER, Committee

Mr. Casanave paid tribute to the excellence of the report. He referred to the claims of the contracting chill makers as to the superior uniformity of chill in their wheels. He argued that the committee should next year obtain actual facts to substantiate or refute these claims. It was exceedingly important, he thought, to have a uniform depth of chill, for the value of a wheel with a chill $\frac{7}{8}$ inch deep in one place and $\frac{1}{8}$ inch deep in another was limited to its value at the $\frac{1}{8}$-inch spot. He moved that the committee be continued to another year with instructions to especially investigate and report upon the relative merits of contracting chill and other wheels.

Mr. Bissell urged that it was important that a wheel should be true as well as having a uniform chill.

The committee was continued for another year with instructions as above.

The Committee on Resolutions offered the following, which was adopted:

Resolved, That the thanks of the Association be tendered to the several parties who have so kindly contributed to the success of the convention and to the pleasure of the members, as follows:

To the citizens of Saratoga for their hospitable reception and welcome, as exhibited to the Association by the President of the village.

To the Delaware & Hudson, Fitchburg, and New York Central Railroad companies for the courtesies of transportation and excursions as tendered by their representatives.

To the *Railway Age and Northwestern Railroader* for its prompt and complete daily reports of the proceedings of the convention.

To the manager of Congress Hall Hotel for his accommodating spirit in extending to members and guests all possible comforts and conveniences.

R. H. SOULE, W. H. DAY, Committee.

The report of the Committee on Steel Tired Wheels was then read by the Chairman, Mr. R. E. Marshall.

Steel-Tired Car Wheels.

Your committee regrets that on account of its inability to get sufficiently definite informatien, either from members of the association or manufacturers of steel-tired wheels, it is unable to submit any data that can be considered satisfactory or conclusive, many of the representative members of the association, also several of the large manufacturers of steel-tired wires, having made no reply to circulars of inquiry.

Returns received from 28 lines, representing 12,423 passenger cars of the 30,650 given by Poor as the total equipment in the United States and Canada in 1891, show that they have used, approximately, the following steel-tired wheels:

Type of center.	Make.	Number of wheels.
Bolted centers	Allen	14,618
	Allston	16
	Boies	2,487
	Krupp	260
	Paige	1,876
	Snow	1,234
	Total	20,491
Solid wrought spoke	Arbel	404
	Brunswick	1,354
	Krupp	80
	Total	1,838
Solid wrought disc	Krupp	924
	Total	924
Solid cast	Snow (boltless)	8
	Washburn	1,673
	Total	1,753
	Grand total	25,006

Defects of centers have been reported in tangible shape only in a few instances; the most of the defects given relating to the tires and not to the centers, and it would seem that the records kept by many do not enable them to trace, accurately, the latter. The information before your committee, however, shows that none of the bolted centers reported are entirely exempt from trouble with loose bolts.

The maximum variation in weights of the different types of centers is about 200 pounds for wheels 33 inches in diameter; the solid wrought spoke centers being the lightest and the solid cast centers the heaviest, the bolted centers and the solid wrought disc centers varying between these two.

R. E. MARSHALL, C. H. CORY, J. O. PATTEE, Committee.

The report was received and committee continued.

At the afternoon session the report of the Committee on M. C. B. Automatic Coupler Standards and Limits was read by the Secretary.

Report on M. C. B. Automatic Coupler Standards and Limits.

Your committee appointed to consider the subject of the maintenance of the standards of the Association for couplers of the M. C. B. type would respectfully submit the following report:

1st. For the preservation of the contour lines and the thickness of knuckle, the committee recommends the gauges proposed by the Executive Committee in their announcement of September, 1891, together with the limits of variation allowed by these gauges. It is difficult to compare the gauges for contour lines submitted in the report of the Executive Committee to the convention of 1891, and accepted by that convention, with the revised gauges offered in the announcement of the Executive Committee dated September, 1891, nor have the limits of variation proposed to the convention been strictly adhered to in the revised limit gauges, either for the contour lines or for the measurement of the knuckle. The revised gauges and the new location of ruling points not only preserve the contour lines, but will also render it impossible to make any local change in the contour lines which would prevent the interchange of couplers of the M. C. B. type. The committee are therefore unanimous in recommending the adoption of the gauges submitted to the association in September, 1891, by the Executive Committee, pursuant to the instructions given them at the convention of 1891. It has been ascertained that the allowable limits of variation from the standard lines are sufficient to cause no difficulty in the manufacture of the couplers.

2d. The committee recommends the adoption of the limits for standard rectilinear measurements as given in the table with Fig. 3 of the September report of the Executive Committee. In recommending these measurements your committee considers it proper to call attention to dimension

"D," that is, the width and depth of the shank immediately behind the head of the coupler, and the advisability of increasing the width. Your committee finds, after careful investigation, that the most serious failure of couplers takes place in the guard arm. Increasing the width at this point will admit of strengthening the guard arm, and will also provide additional strength to prevent pulling off the head of the coupler. A failure of this kind usually permits the head of the coupler to fall upon the track with occasionally disastrous results. Various devices have been adopted to prevent the coupler from falling upon the track in case of the failure of the end fastening, but no means has as yet been provided, so far as we know, to prevent the head from falling upon the track when it becomes broken from the shank of the coupler.

3d. The committee recommends the adoption of a standard method by the association for operating the locking devices of the M. C. B. couplers.

4th. The committee recommends the adoption of a more secure fastening than the tail bolt for automatic couplers; the "U" shaped, or pocket fastening seems to offer a very much more secure and efficient device for this purpose.

There are features in couplers which it is as essential to provide for, as limit gauges and strictly defined contour lines. In the construction of railway equipment steel and iron are bought under specifications, and wheels and axles are subjected to carefully considered drop tests; also, chemical analyses, in addition to the physical tests, are being exacted for bearing metals and springs, and nearly all materials have their prescribed limits as to quality. Up to the present time, however, no requirements have been exacted for couplers, and your committee considers it vital that the importance of this matter be recognized by the association. Acting upon this belief certain prescribed tests were formulated, and a general invitation was issued to all manufacturers of vertical plane couplers to meet the committee, not only for the purpose of securing uniformity in the M. C. B. standards, but also to settle upon a standard of excellence in material and design. The tests to which couplers should be subjected were willingly agreed to by a large majority of the manufacturers present, and your committee, therefore, submits the following specifications for your consideration:

1. WEIGHT.—Drawbars, including knuckles and locking attachments, should weigh 210 pounds or less; they must not weigh over 220 pounds.

2. DROP TEST.—*Description.* All drop tests will be made on a solid masonry foundation 4×4×4 feet. In testing drawbars for buffing blows they shall be placed in a vertical position, the shank resting upon the foundation and with the knuckle in its locked position. The bottom of the drop will be flat so as to represent the blows from an opposing M. C. B. drawbar.

3. PULLING TEST.—Drawbars, when subjected to this test, must stand a pull of not less than 100,000 pounds. A draft bolt or stirrup must be attached to the drawbar and subjected to the same pull, so as to strain not only the knuckle and locking device, but also the end of a shank of the coupler.

4. DROP TEST.—Drawbars must stand the following drop test: Weight of drop, 1,640 pounds, three blows at 10 feet, two blows at 15 feet. The drawbar or knuckle must break into two or more pieces before it is considered to have failed under this test. The cracking of the parts will not be considered as a failure.

5. In testing drawbars, if the knuckles fail and the bars stand the test, the bars will be accepted if satisfactory knuckles are provided, or if the bars fail and the knuckles stand, the knuckles will be accepted if satisfactory bars are supplied.

Your committee also recommends that additional tests should be provided for the following, although we have as yet been unable to unite on any definite recommendations: 1. Guard arm tests. 2. A drop test to represent the shock to which couplers are subjected in pulling. 3. Tests to determine the resistance of the coupler to distortion within the limits of the gauges.

Your cemmittee does not advise that the above tests be acted upon at this meeting, for the reasons that their recommendations are largely speculative, but they do recommend that they be accepted provisionally, and that final action be taken one year hence. To further a proper consideration of this matter, we also recommend that the Executive Committee of the Association should consider the advisability of calling for a laboratory test of couplers to be held some time during the month of October or November. Couplers from each well established manufacturer should be obtained, and the results of tests published. By naming a date late in the year, all coupler companies will have opportunity to make such improvements in their product as may seem best to them to bring about the highest efficiency.

Your committee further believes that by properly representing this matter to the State Commissioners or the Interstate Commerce Commission, the privilege of making these tests at the Government Arsenal at Watertown, Mass., would be obtained. They deem it advisable that the tests should be made at this point for obvious reasons.

J. S. LENTZ, G. W. RHODES, J. M. WALLIS, Committee.

The report was received and the committee continued.

Mr. Waitt moved that the recommendation of the committee that "the adoption of the gauges submitted to the association in September, 1891, by the Executive Committee" be adopted and submitted to letter ballot. The motion was carried.

Mr. Wm. Forsyth moved that the second recommendation of the committee, relating to the dimensions of the barrel of the coupler be accepted provisionally for the coming year and that it be referred to the committee for final action at the next convention. Adopted.

Mr. Barr moved that as to the specifications for M. C. drawbars presented by this committee, it is the sense of the convention that they should be provisionally adopted and acted on during the period between this and the coming convention. The motion was carried.

On motion by Mr. Waitt the recommendation of the committee as to the advisability of additional tests, etc., was referred to the executive committee for such action as it might deem wise.

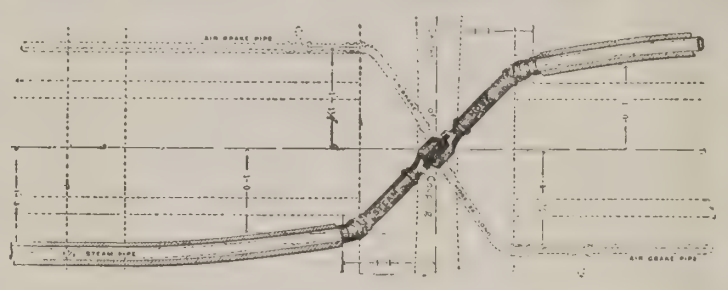
The report on steam heating and ventilation of passenger equipment cars was then presented by Mr. Barr.

Steam Heating and Ventilation of Passenger Equipment Cars.

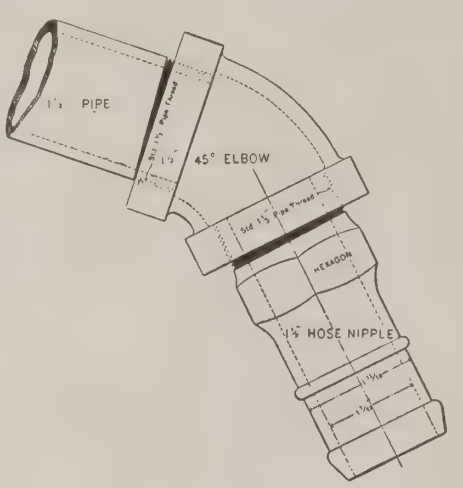
Heating of cars by steam has in the past year made very little advance in methods, but a very decided advance in the number of cars equipped for this purpose. This would indicate that the present devices used for the purpose are reasonably satisfactory. The tendency in the past year to eliminate complications and refinements of design, based on theoretical considerations as to what constitutes a perfect system of heating cars by steam, is clearly apparent. For example, a temperature regulator has been abandoned on several large lines, not because the device is not desirable, nor because it did not perform its work satisfactorily when in order, but because better results were obtained by removing this complication and making uniformity of temperature dependent on the care and attention of the trainmen, as has been done heretofore with the Baker heater and the ordinary car stove.

The idea of cutting off a portion of the radiating surface of the pipes within the car in mild weather has also been abandoned in some cases, not because the arrangement when in working order did not give very satisfactory results, but because the complication produced by the additional valves, etc., necessary to accomplish results were found more objectionable than the advantages gained by their use. It is not possible yet to say just how far this tendency to simplification may extend, and it will depend to a very great extent on the devices used. Your committee will therefore not attempt to formulate any ideal set of requirements which should be met in order to constitute a perfect system of steam heating.

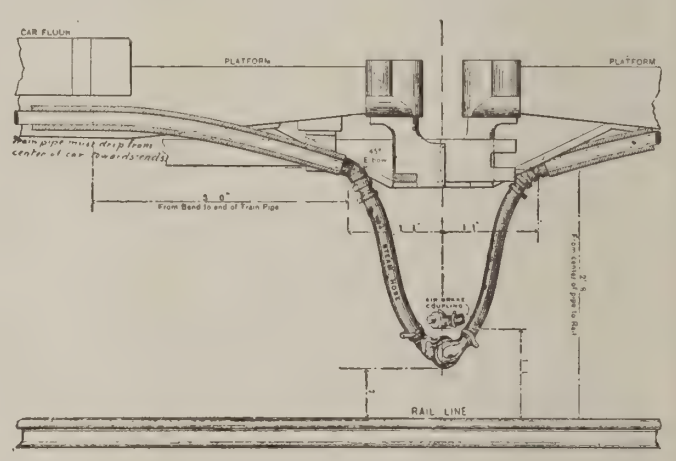
At the present time the various methods of heating cars by steam may be grouped into two classes, known as the direct and indirect, the distinction between the two being as follows: In the direct system steam is supplied directly to radiating pipes in the car. In the indirect system steam is used to heat water contained in the radiating pipes in the car. The direct system is the cheaper and simpler, but it is not susceptible of as fine regulation as the indirect, although care and attention on the part of the trainmen have given very satisfactory results. The direct system also is inapplicable to cars like sleepers in which the piping is necessarily tortuous, or in cars equipped with Baker or other hot-water heaters, unless a complete additional equipment of radiating pipes is introduced. Various arrangements, some of them quite successful, have been devised for heating the water in the circulating pipes of the Baker heater by steam, leaving the heater itself intact and ready for use, in case the steam supply should fail. It is generally recognized to-day that this is the proper method of heating sleepers by steam. Here, as in all other cases, simplicity is a desideratum, and the tendency in this direction is clearly to be noted.



Location and Size of End of Steam Pipe.

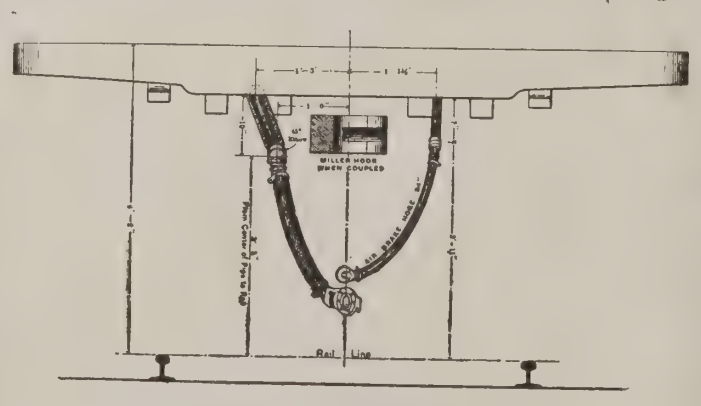


Standard Elbow.



Standard Steam Hose.

The immediate and most important object of this committee is to consider the points involved in steam heating so far as they affect the matter of interchange of cars having different systems of heating or different steam connections or couplers. With this object in view the accompanying Figs. 1, 2 and 3 are presented fixing the following points: 1. Location and size of end of steam pipe. 2. Standard 45-degree elbow for end of steam pipe. 3. Standard hose nipple. 4. Standard steam hose. 5. Location of steam coupling. It will be remembered that this Association, at its Twenty-fourth Annual Convention in 1891, adopted a standard fitting for the end of steam pipes. At that time very little experience had been obtained in the matter and subsequent developments have made this standard useless. Your committee would, therefore, recommend its abandonment as we do not know of any case in which it is used to-day.



Standard Hose Nipple.

The adoption of items one, two and three as standard, or even of one and two, with the hoze nipple of the proper size to fit the elbow, would afford means of promptly interchanging cars. At the same time it is considered advisable to fix the length at least of the steam hose and the location of the steam coupling in order to prevent interference with the air-brake coupling.

J. N. BARR, J. C. BARBER, W. H. LEWIS, T. A. BISSELL, J. W. MARDEN, Committee.

After brief discussion it was voted to adopt the recommendations of the committee provisionally, for the coming year, and the executive committee was instructed in publishing the cuts to eliminate all similitude to patent devices.

On motion the committee was discharged.

The report of the committee on standards of the association was then read.

Standards of the Association.

The committee reported that it had construed its instructions as requiring it to ascertain to what extent the standards of the association are observed, to draw inferences as to the merits of the several standards, and to make such recommendations in refcrence to them as would be warranted by the facts. About 450 circulars of inquiry had been sent by the committee to master car builders, managers of fast freight lines, and manufacturers of cars, cast wheels, steel tires and steel tired wheels, and vertical plane couplers. Only about 111 answers were received.

The following is a brief statement showing to what extent the several standards of the association are observed (as far as can be inferred from the information received.)

Specifications for Cast Iron Wheels.—Adopted by about 54 per cent. of the railroads, controlling about 41 per cent, of the cars. Not adopted by about 46 per cent. of the railroads controlling about 59 per cent. of the cars.

Of those railroads which have adopted the specifications for cast iron wheels about one-half conduct their own tests while the remaining half are content to either have the tests conducted by the wheel manufacturers, or to entirely dispense with them. Similarly, about one-half of the railroads (which have adopted the specifications) use the three-point support, while the remaining half use the ring support. The returns have also incidentally brought out the information that about 16 per cent. of our railroads make their own wheels, while about 84 per cent. purchase them from wheel manufacturers. Of the railroad companies which make their own wheels, only about one-fourth observe the requirements of the M. C. B. standard specifications as regards inspection and test. The wheel manufacturers, without exception, either observe the M. C. B. standard specifications or are entirely ready to observe them if the railroad companies do not require observance of some other and different specifications. The wheel manufacturers say that about one-half of the wheels which they sell to railroad companies or to car manufacturing companies are tested by the representative of the purchasers, while the remaining half are tested by their own representatives. This agrees closely with the information on this subject received from the railroad companies. Of the wheel manufacturers about two-thirds use and prefer the three-point support, while the remaining one-third use and prefer the ring support.

Guarantee for Cast Iron Wheels.—Adopted by about 40 per cent. of the railroads, controlling about 32 per cent. of the cars. Not adopted by about 60 per cent. of the railroads, controlling about 68 per cent. of the cars.

Form of Wheel Tread and Flange.—For chilled cast iron wheels. Adopted by about 84 per cent. of the railroads controlling about 70 per cent. of the cars. Not adopted by about 16 per cent. of the railroads, controlling about 30 per cent. of the cars. The railroad companies have very generally adopted the standard form of wheel tread and flange, the principal exceptions being the Pennsylvania Railroad and the Chicago, Milwaukee & St. Paul. Nearly all of the railroads that have adopted the standard apply it to both chilled cast iron and steel tired wheels, although there are two or three roads that report using the standard section for chilled wheels and a different section for steel tired wheels. There seems to be no good reason for this practice.

Difference Between the Backs of Flanges of Car Wheels.—It is the almost universal practice of railroad companies and car manufacturing companies to follow the M. C. B. standard, both as regards the distance of 4 feet 5⅝ inches between the backs of the flanges of wheels (when mounted on axles) and also as regards the limits of variation under which a maximum distance of 4 feet 5½ inches and a minimum distance of 4 feet 5¼ inches (between the backs of flanges) are permissible. The Pennsylvania Railroad Company uses a wheel having a thicker flange than the M. C. B. standard.

Wheel and Axle Gauges.—It is evident that these standard wheel and axle gauges (with the exception of the circumference measure) are not respected. A great many of the railroad companies and some of the car manufacturing companies and wheel manufacturing companies report that they do not observe the Master Car Builders' standard practice in this matter of gauges, but that they have gauges of their own design which they consider much superior to those recommended by the Master Car Builders' Association.

Boring Wheels.—This standard is entirely disregarded and there is no evidence that there is the slightest tendency toward its observance.

Standard Axles.—Axles with 3¾ inch × 7 inch journals, 6 feet 3 inches centers, and 6 feet 11 inches over all. Adopted by about 60 per cent. of the railroads controlling about 50 per cent. of the cars. Not adopted by about 40 per cent. of the railroads, controlling about 50 per cent. of the cars. There seems to be a growing feeling that this axle is somewhat light for cars of 50,000 pounds capacity. This is evidenced in two ways:

First. Quite a number of roads are using under cars of 50,000 pounds capacity, an axle exactly like the standard axle above referred to, except that the journal is made 4 inches by 7 inches instead of 3¾ inches by 7 inches. Second. A considerable number of roads limit the use of this axle (with journal 3¾ inches by 7 inches) to cars of 40,000 pounds capacity or less, and use under both 50,000 and 60,000 pound cars the M. C. B. standard axle with journal 4¼ inches by 8 inches.

There is also a slight, but less noticeable tendency to increase the diameter of this axle at the center; some roads are making these axles 4⅛ inch center instead of 4¼ inch, which is the standard dimension.

Axle with 4¼ Inch by 8 Inch Journals, 6 Feet 3 Inch Centres, 7 Feet 0¼ Inches Over All.—Adopted by about 72 per cent. of the railroads, controlling about 62 per cent. of the cars. Not adopted by about 28 per cent. of the railroads, controlling about 38 per cent. of the cars.

The above percentages refer to the use of these axles under freight equipment cars only.

There are a considerable number of railroads using under their passenger equipment cars, either one or both of the M. C. B. standard axles.

Journal Box for Axle 3¾ by 7 inches.—Adopted by about 73 per cent. of the railroads, controlling about 50 per cent. of the cars. Not adopted by about 27 per cent. of the railroads, controlling about 50 per cent. of the cars.

Only a few roads have yet adapted this journal box to take the new standard top hinged lid. The majority are still using the Fletcher lid (either side pivoted or top pivoted), and a considerable number are using the Hewitt lid.

Journal Box for Axle 4¼ by 8 inches.—Adopted by about 60 per cent. of the railroads, controlling about 50 per cent. of the cars. Not adopted by about 40 per cent. of the railroads, controlling about 50 per cent. of the cars.

But few roads have adapted these journal boxes to take the standard top hinged lid. The majority are using the Fletcher lid, and many the Hewitt lid. The standard wedge and bearings designed for these boxes are generally used.

The information relating to journal boxes under passenger cars is to the effect that the small box (designed for 3¾ × 7 inch journals) is extensively used, while the large box (designed for 4¼ × 8 inch journals) is seldom used under passenger cars.

The standard pedestal for passenger car trucks is generally used throughout the country.

A train pipe air pressure of 70 pounds per square inch seems to be a general standard for both passenger and freight trains.

The Committee knows of no reason for departing from the standard train pipe air pressure of 70 pounds per square inch, unless where it has been shown that the system of brake leverages applied to cars had been improperly designed, under which circumstances it might, of course, become necessary to increase the working air pressure in order to get an efficient brake, or, on the other hand, to decrease the air pressure in order to prevent sliding wheels.

Most roads state that their airbrake gear under freight equipment cars is designed to utilize about 70 per cent. of the light weight of the car, although several roads report utilizing larger percentages, ranging up to a maximum of 90 per cent. The percentage of light weight utilized by the hand brake is somewhat uncertain and indeterminate, so that the committee is not even able to report the prevalent practice.

The standard arrangement of brake levers on freight equipment cars fitted with air brakes is almost universal.

The standard rods, levers, etc., for use under freight equipment cars which are equipped with the air brake, are in almost universal use throughout the country.

A few roads, while conforming to the Master Car Builders' Standard Brake Gear in almost every detail, nevertheless, make a few slight deviations; for instance, the Lake Shore uses a bottom rod ⅞-inch diameter instead of ¾-inch diameter; the Richmond & Danville uses pins 1-inch rough instead of 1⅜ inches turned; the C. B. & Q. uses the standard jaw, except that the opening is reduced from 1⅛ inches to 1 1/16 inches.

The standard location for train pipe cocks and dummy coupling on freight cars with air brakes is almost universally observed.

The committee felt that it was expected of them to ascertain to what extent the Westinghouse iron brake beam was used. The result of this inquiry indicates that it is but seldom used, while on the other hand the returns show that the National Hollow brake beam is in more general use than any other iron brake beam.

The facts in reference to the use of iron brake beams are as follows:

National Hollow used by 85 per cent. of the railroads, controlling 80 per cent. of the cars. Other kinds used by 15 per cent. of the railroads, controlling 20 per cent. of the cars.

All the railroad companies using iron break beams claim that they conform to the master car builders' standard as regards strength and deflection.

The M. C. B. standard is to place the break beam lever at an angle of 40 degrees from a vertical plane. This standard is very generally observed; only a few roads report variations, and those range only between the extremes of 30 degrees and 50 degrees.

The returns indicate the use of brake heads and shoes as follows: The Christie is used by 61 per cent of the railroads, controlling 76 per cent of the cars. The Collin is used by 26 per cent of the railroads, controlling 11 per cent of the cars. Other kinds are used by 13 per cent. of the railroads, controlling 13 per cent. of the cars.

The Pennsylvania Railroad is the only large system now using the Collin brake shoe and head; the Norfolk & Western is also using the Collin brake shoe and head, but will apply the Christie brake shoe and head on all iron brake beams. The other roads using the Collin brake shoe and head have a very small freight equipment. This is indicated by the fact that although the Collin brake shoe and head are used by 26 per cent of the railroads, they control only 11 per cent. of the cars.

The "Sellers," or "Franklin Institute" or "United States" system of screw threads, which was adopted as the standard of the Master Car Builders' Association in 1872 is in almost universal use, both by railroad companies and car manufacturers; the only reported exception being the Grand Trunk, which states that its system of screw threads is "partly Whitworth."

The M. C. B. limit gauges for round iron are used by comparatively few roads, and apparently by none of the car manufacturing companies, and there is no evidence that the use of these limit gauges has been increasing or is likely to increase in the future.

The M. C. B. standard height of drawbar for freight equipment cars is 33 inches. The returns indicate that only 54 per cent. of the railroads set their freight cars to a height of 33 inches from top of rail to center line of drawbar. There is a marked tendency to increase this height; in fact, 46 per cent. of the roads reporting state that they are mounting their freight equipment cars so that the level of the center line of the drawbar ranges from 34½ to 35 inches above the top of the rail.

The Master Car Builders' standard height of drawbar for passenger equipment cars is 35 inches, and this practice is observed and adhered to almost universally throughout the country.

The information received by the committee indicates that only about one-half of the railroads use safety chains between the platforms of passenger equipment cars, and it is doubtful whether any of those roads which do use such safety chains, construct them in exact conformity with the M. C. B. standard.

The Master Car Builders' standard requirements for attachments of drawbars are almost universally disregarded, and there is practically no general conformity with either of the prescribed conditions and dimensions.

Automatic Couplers.—Information received from the manufacturers of vertical plane couplers indicates that those vertical plane couplers which are now in general use conform very closely to the general dimensions laid down by the Master Car Builders' Association as standard.

The committee on standards did not feel it incumbent on them to make close study of the contour lines of the different vertical plane couplers now in use, inasmuch as that matter was under consideration by another committee.

Draw springs of a capacity less than 18,000 pounds are the exception. The tendency is to increase the capacity of draw springs, and a considerable number of roads are now using draw springs of 19,000 pounds or even of 20,000 pounds capacity.

Dead Blocks.—The indications are that not a single road in the country adheres to the M. C. B. standard. They are deviating from the standard in every particular.

Train Pipe Fitting for Steam Heat.—The M. C. B. standard requires the use of train pipe terminating in a two-inch female fitting, with standard pipe thread. This standard is observed by only two or three small systems.

Protection of Trainmen from Accidents.—Only two roads the Lake Shore and the Buffalo, Rochester & Pittsburgh) conform in all respects to the standard requirements of the association, and only three other roads approximate to the requirements. The great majority of the roads have arranged their brake staff, ratchet wheel, running board, running board brackets, sill steps, ladders, and hand holds, without any reference to the requirements of the association, although the majority of the roads have adopted reasonably safe arrangements. Check chains between the side timbers of trucks and the side sills of passenger equipment cars are in very general use.

Loading Logs, Poles and Bark on Cars.—A majority of the railroads have issued instructions in reference to loading logs, poles and bark, which are either in exact conformity with, or close approximations to the standards of the association.

Marking Cars.—This standard simply requires that all railroad companies whose initials are the same as those of other railroad companies, should spell out in full (on some part of the car where it can be readily seen by freight agents) the name of their road. The practice is very generally followed.

Lettering and Numbering Fast Freight Line Cars.—The M. C. B. standard system is observed by only a few railroads or fast freight lines. The fast freight line managers in general think it desirable to have a standard system, but they object to the M. C. B. standard system, principally on the ground that the railroads contributing cars to fast freight lines almost invariably desire to give a prominent place to the name of the road owning the cars.

RECOMMENDATIONS.

In view of the facts which have been recited, the committee is ready to advise that the following standards should be rescinded and abolished:

Diameter testing gauge, flange and journal gauge, wheel bore testing gauge, journal length and diameter gauge, guard railgauge, centering and journal shoulder gauge, journal distance gauge, boring wheels (the use of six dogs), attachments of dimensions of drawbars, train pipe fitting for steam heat.

The present standards of the Master Car Builders' Association are the result of their deliberations through a long period of years. Many of the earlier standards were adopted when the association was in its infancy, and there has been a great deal of legislation under the general heading of standards, which has resulted in the acceptance and promulgation of certain forms of construction or forms of practice, which, in our judgment, ought never to have been classified as standards. It is the opinion of the committee, therefore, that what are now comprehended under the general category of standards of the association should be divided into two groups; the first group to be continued and maintained as the standards of the association, the other group to be rescinded as standards, but to be established as recommended practice; these two groups of subjects may be defined as follows:

Standards.—Those forms, parts, construction, units, measurements or systems in which it is desirable to secure not only sound construction, good practice and safe operation, but which also promote quick and cheap repairs and consequent free interchange of cars.

Recommended Practice.—Those forms, parts, construction, units, measurements or systems which are conducive of sound construction, good practice and safe operation, but which do not affect either interchangeability of parts or interchangeability of cars as a whole.

The present standards of the association would naturally group themselves under these revised headings as follows:

Standards.—Section of wheel tread and flange; axles; wheel circumference measure; gauge for mounting wheels, journal boxes, journal bearings and wedges; journal box lids; vertical plane couplers; height of drawbar; brake shoe and head; general arrangement of brake levers (for air brake); iron brake beam, angle of brake lever; details of rods, levers, etc. (for air brake); train pipe pressure (for air brake); location of dummy couplings (for air brake); percentage of light weight braked (for air brake); passenger truck pedestal; screw threads.

Recommended Practice.—Diameter of chill molds; capacity of draw springs; specifications for cast iron wheels; limit gauges for round iron; guarantee for cast iron wheels; loading logs, poles and bark on cars; protection of trainmen; marking cars; dead blocks; lettering and numbering fast freight line cars; platform safety chains; truck check chains.

It is believed that this limitation of the word "standard" would inspire respect and would result in the more general observance of standards than now.

The committee offer the following suggestions in reference to the present standards if subdivided and grouped separately as standards and as recommended practice.

STANDARDS.

Axle: The committee is of the opinion that it would be expedient to submit to a special committee appointed for the purpose the question of modifying the present light axle so as to make its journal 4 inches by 7 inches instead of 3¾ inches by 7 inches, as now.

Journal Boxes: It is suggested that the drawings of the present standard journal boxes, if reproduced full size, should be very carefully revised, as there are evidences that the present drawings are not complete in every respect.

Journal Box Lids: The drawings should be revised, together with the drawings of the journal boxes.

Journal Bearings and Wedges: The designs for these parts also need to be carefully re-dimensioned.

Height of Drawbars: The indications are that standard height of 33 inches for freight equipment cars has not been adhered to, and that there is a tendency to increase this height. It would, therefore, seem well to have the facts reviewed by a special committee who should advise whether it was expedient to modify the standard height of drawbars for freight equipment cars.

Iron Brake Beam: It is suggested that the drawing should be revised to simply show the center lines of a triangular brake beam without showing any specific construction of brake beam, but distinctly showing the Christie brake head and shoe in position; the distance from center to center of brake heads; the location of brake beam strut; the angle of the brake lever which passes through the strut, etc., etc.

Passenger Truck Pedestal: It is possible that this standard could be slightly modified so as to produce a more pleasing outline, and also so as to introduce a third bolt in the upper flange and thus accomplish more secure fastening to the truck side timber.

[The committee believed all other standards to be all right.]

RECOMMENDED PRACTICE.

Protection of Trainmen: It is suggested that this standard should be carefully reconsidered and revised, with the idea of eliminating the dimensions of detail parts and confining the recommendations of practice for the safety of trainmen to a few general suggestions without restriction to certain dimensions. The present standards are so widely departed from that it would seem prudent to reconsider them and bring them into closer average conformity with existing practice.

Platform Safety Chains: It is suggested that this standard should be revised as a recommended practice and made to relate only to the general use of platform safety chains without defining and requiring a specific construction.

Lettering and Numbering Fast Freight Line Cars: It is recommended that this standard should be given over for consideration to a special committee, with instructions to report a recommended practice after consultation with the Car Accountants' Association and with the managers of fast freight lines.

[The committee believed all other recommended practices to be all right.]

It is the conviction of the committee that the method of publishing the standards of the association is susceptible of improvement, and it begs to suggest that hereafter the standards and recommended practices of the association shall be published in pamphlet form with references to lithographed drawings, the latter giving, when possible, full size illustrations of the various standards and the various recommended practices.

R. H. SOULE, E. CHAMBERLAIN, WM. MCWOOD, *Committee.*

This splendidly comprehensive report was received with a demonstration of the proper appreciation of its excellence, the thanks of the convention were warmly tendered and the subject continued and made the first subject for consideration at the next convention.

On motion the recommendations in the report as to committees was referred to the executive committee with authority to appoint such committees as it may think proper.

The report on standard efficiency for air brakes was then presented.

Report on Standards of Efficiency for Airbrakes.

In submitting a report on the above subject a brief outline of some of the reasons which make its consideration at the present time important would seem proper.

Developments in power brakes for freight train service during the past year have again brought the subject of train brakes prominently before the railroads of this country. In 1887 as well as 1886 the results of the brakes tested were such that they made specific recommendations impracticable, and even the following year, with every indication of one successful airbrake in the field, any definite recommendation would hardly have been wise if even in keeping with the constitution of the Master Car Builders' Association. Sufficient progress has been made in the art to materially alter these conditions. With the strong competition now prevailing in transportation, and the reduced profits in the business, there not only is, but will in the future be, a strong temptation to railroads and individual car owners to use devices which an intelligent investigation would condemn. The Master Car Builders' Association can aid very materially in providing against such difficulties by establishing standards of efficiency to which the devices shall be subjected before they obtain the official approval of the association. On the brake question the tests made at Burlington in 1886 and 1887 have effectually kept out of railway service a class of brakes known as independent or buffer brakes. During the tests, however, it developed that there were air brakes which were just as impracticable as independent brakes, and yet at the present time everything under the name of "air brake" is accepted as a safety appliance. To show that this matter may become in future quite a serious one, it is only necessary to state that at the present time your committee is in correspondence with nine different airbrake companies, and that in several instances these represent more than one style of triple. The brake question has always been a complex one, and it is difficult for those best posted in the matter to draw accurate conclusions unless the devices are tested on a rack under identical conditions or in actual service. Airbrakes have been put on the market and sold which lack some of the most essential features of an effective brake. As a matter of fact, manufacturers have not only deceived themselves but deceived their patrons, and this, notwithstanding the closest investigation having been made by all parties. The experts in the country have been unable to detect from an examination of models and drawings whether essential features, such as quick action, graduation, etc., existed or did not exist. Public opinion and general knowledge of the subject will effectively keep out the further introduction of independent brakes, which were making such headway prior to your 1886 and 1887 investigation. There is, however, no board of censorship or test to keep out impracticable airbrakes, or to establish which of the new devices are really meritorious. It would seem a fitting time then for the association to be considering a series of requirements which shall be exacted from all airbrakes prior to their receiving the indorsement of the association.

[Here followed the requirements and conditions of tests, published in the June NATIONAL CAR AND LOCOMOTIVE BUILDER, the only departure made from same being in the revision of the sixth paragraph describing the conditions of release test. This now reads]:

A uniform pressure of 70 pounds having been secured in the train pipe, all the air will be exhausted by an emergency application. A pressure of 90 pounds will then be maintained against a diaphragm perforated by a 3-32 hole, and a record taken of all brakes that release inside 30 minutes. In making this test special care must be taken to see that there is no leak in the train pipe.

[In condition (*e*) of tests to determine the time of charging one auxiliary reservoir to 70 pounds pressure the requirement is that it must not exceed 60 seconds nor be less than 45 seconds.]

In submitting the above, your committee does not recommend that the association take final action on the report at the present time. What is presented is intended more as an outline to be improved upon during the coming year. Some of the recommendations are still imperfect and require more work and investigation; especially is this the case with the graduation test. Several of the other tests have also to receive more careful consideration. Your committee realizes fully the importance of having nothing but the most searching requirements, nor have they lost sight of the fact that in future there will be competition in brakes. Under such circumstances the association must fully consider whether it is not its duty to prescribe the most exacting requirements now attainable by any brake company, even to that of working successfully on a 100 car train.

In following out these investigations your committee has met with much encouragement from members of the committee on safety appliances of the American Railway Association, and has been in conference with its members about facilities for conducting tests. An essential feature of this work is a permanent location for carrying on the investigations with pipe rack, gauges, recording apparatus, competent assistants, etc. Several of the brake companies have very considerately placed at the disposal of the committee their racks. The committee, however, is glad to announce that the Pennsylvania Railroad Company has offered to establish for the association, at its Altoona shops, a complete set of brake-testing apparatus, and to give every facility for furthering these investigations. This secures for your association everything that any organization would desire, and when fully established will, without doubt, confer lasting benefits on the railroads of this country.

(*Continued on page* 111.)

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

SPECIAL ANNOUNCEMENT.

COMPOUND LOCOMOTIVE TESTS.

The report of the committee of the Master Mechanics' Association on the tests of compound locomotives conducted by it is one of the most admirable contributions to engineering literature presented in recent years, and does great credit to the committee, to the association, and to the officers of the Chicago, Milwaukee & St. Paul Ry., who spared neither expense or labor in providing everything necessary to facilitate the work of the committee. The methods of conducting the tests and drawing conclusions from the data obtained appear entirely above criticism, and it may be accepted that the report presents the most valuable and reliable information regarding the respective merits of simple and compound locomotives that has yet appeared.

It is established by the report that there is a decided economy of fuel effected by compounding, although the definite percentage of saving in any kind of service has not yet been settled, but appears to range, on an average, between 10 per cent. and 15 per cent. These figures coincide with those obtained by the Southern Pacific tests, which, because continued long enough to obtain reliable averages, are the most reliable tests of compound locomotives yet conducted by an American railroad. These tests establish a percentage of economy of fuel for compound locomotives in heavy freight service close to 15 per cent. The results of the Southern Pacific tests were obtained with both simple and compound engines working at the same boiler pressure, and all other conditions as nearly alike as possible.

It must be considered as an unfortunate feature of the committee's tests that it was found necessary to run the compound engine with 20 pounds excess boiler pressure over the simple engine. It was remarked in the discussion of the report that this was all right—that higher boiler pressures constituted a part of the legitimate field of compound locomotives, and if the simple engine could not use the higher pressure with equal advantage, it simply proved the superior capabilities of the compound.

While this is true to some extent it does not apply to this particular case. In the committee tests the simple engine was run at the lower pressure, not because it was found uneconomical to run it with the higher pressure, as was the case with the compound at the lower pressure, but because of the imperfectly balanced valves of the simple engine running dry with the higher pressure. This has nothing to do with the principle of compounding, and the fact remains that running the compound with the higher pressure introduced an important but immeasureable element of uncertainty in the results.

The general conclusions to be drawn from the report are that compound locomotives are competent for all kinds of road service, and probably to burn successfully all kinds of fuel acceptable for simple locomotives, and that they are more economical of fuel than simple locomotives, the exact percentage of saving of fuel not yet being determined, but probably lying somewhere between 10 and 15 per cent. in ordinary service.

THE MASTER CAR BUILDERS' AND MASTER MECHANICS' CONVENTIONS.

The annual conventions of the Master Car Builders' and Master Mechanics' Associations, which were held at Saratoga during the past month, will long be remembered by those who attended as among the most interesting and important conventions of the respective associations. The wisdom of holding the two conventions as close together as practicable was demonstrated by the large attendance at the meetings of both, 110 members attending the Master Car Builders' convention, and over 150 members attending the Master Mechanics' convention, being, in the latter case, the largest attendance in the history of that association.

While interesting and important in the sense of subjects discussed and results accomplished, other features contributed in several ways to make the gatherings memorable and pleasant experiences. The weather appeared to be under the control of the Entertainment Committee as the temperature was generally in nice accordance with the programme. There was scarcely an unpleasantly warm hour during the sessions of either convention, the nights were delightfully tempered, and the day selected for giving the Master Car Builders an excursion to Lake George, about 50 miles distant from Saratoga, was, as it should be, the coolest day of all.

In convention better order was preserved than last year, which greatly aided the transaction of business and lessened the labor of the presiding officers.

New presidents were elected for both associations, Mr. E. W. Grieves to succeed Mr. John Kirby as President of the Master Car Builders' Association, and Mr. John Hicky to succeed Mr. John Mackenzie as President of the Master Mechanics Association. Both of the retiring presidents lay down their arduous duties after having gained a very high place in the esteem of the members of the associations. Both, also, received abundant assurance of the fact while at Saratoga, Mr. Kirby during the sessions of his association and Mr. Mackenzie a very demonstrative one at the close of his.

In several ways it was made apparent at these conventions that the two associations are drawing closer together in other ways than simply in the time of their annual meetings. A large proportion of those attending the Master Car Builders' Convention and taking prominent part in its proceedings were motive power officers, and resolutions were adopted at the Master Mechanics' Convention providing "that all car builders above the rank of general foreman, having charge of the design, construction or repair of railroad rolling stock, are eligible to membership in this convention," and "that all questions pertaining to the repairs, construction or design of the rolling stock of railways, whether engines or cars, are legitimate questions to come before this association."

In adopting these resolutions an advance step was taken big with possible future results. The requirements of modern conditions are such that the necessity of joint and harmonious action by the two associations is becoming more and more imperative in order to best serve the interests represented by the membership. The more clearly this is recognized and the more liberally and intelligently it is acted upon the more effectually will be advanced the objects of both associations.

REVERSE-LEVER QUADRANTS.

The remarks upon this subject in our last issue has excited considerable discussion and some criticism. That is a good beginning. Reforms are generally preceeded by agitation, and if in this matter we be fortunate enough to excite an agitation that will finally result in the general equipment of American locomotives with close notched quadrants our object will be attained. Designs of such quadrants have been presented, upon which there exist no patents, and all are free to make and apply them at pleasure.

We publish on another page a communication from Mr. John Player, Mechanical Engineer of the Brooks Locomotive Works, in which he claims that the designs of the quadrants illustrated in the June NATIONAL CAR AND LOCOMOTIVE BUILDER originated with him while employed on the West Shore Railroad, and accuses us of giving the credit of the design to the C., B. & Q. and Southern Pacific railways. Our correspondent is mistaken in the accusation, as we did not say that either style of quadrant or lever had been designed by either road.

What we did say was that they had respectively been adopted as standard by those roads, and had improved the management of the engines and saved fuel. We cheerfully give the credit of the design to Mr. Player, and as, since receiving his communication, we have discussed the matter with Mr. Boon, Superintendent of Motive Power of the West Shore, we can say that the claim is entirely correct in every particular.

The reverse lever and quadrant illustrated as the C. B. & Q. standard is, and was first, the standard of the West Shore road. The design of this quadrant is altogether creditable to Mr. Player both for its efficiency and simplicity. Much credit is also due to Mr. Boon who first recognized its merit and adopted it as standard. To locomotive works and master mechanics who have already or will adopt it, or some device of equal merit, the move is creditable to their intelligence and of much value to their patrons or the interests they represent.

There is one detail of the arrangement used on the C. B. & Q., but not illustrated in our drawings last month, which can very well be dispensed with, and that is a pointer on the lever reaching to a row of figures directly beneath the quadrant notches to show what cut off is effected with the lever in that position. In regard to this point we have received a letter from the superintendent of one of the large locomotive works saying that he considered it very essential that quadrants should have their notches marked so as to indicate what cut-offs were effected with the reverse lever in different positions so that the engineer could always know what cut-off his engine was working with.

Our experience has been very convincing that there is no good in this, but much of evil. Such marks or figures upon a quadrant are seldom a correct indication of the cut-off effected; or if they be correct when the engine is new or just out of the shop, a year of service will render them misleading. The wear of reach-rod and valve gear connections in service tends to lengthen the cut-off, so after awhile an engine gets to cutting off about an inch later at the different notches than the marks on the quadrant indicate. Engineers will be guided by these marks, and when they become deceptive, the work or the fuel consumption of the engines suffer. We recently learned of an amusing instance where this peculiarity of runners caused an engine to fail to perform satisfactory work. Four crews ran the same engine in heavy passenger work. After some repairs had been done during which the reach-rod had been shortened somewhat, the engine began to lose time on trains it had always before handled satisfactorily.

As the engine was in perfect order and the same crews operated it the case was a little puzzling at first. The four engineers could not give an explanation; she simply couldn't do the work. The superintendent of motive power in looking over the engine noticed a gash made in the side of the quadrant a short distance ahead of the center. Concluding at once it was a mark or notch used in running he had the valves run over with the lever in that position to ascertain the cut-off and found it to be 4 inches. The difficulty was explained by this. Since the reach-rod had been shortened the cut-off was shortened with the reverse lever in any given position, and neither one of these experienced engineers had sense enough to detect the change, but continued working the engine with the lever at the old land mark. The quadrant was planed off so that no mark appeared, and the engine was sent to another division of the road and thereafter did satisfactory work.

What is needed is not marks, but notches as close together as possible, and instructions to engineers to use the shortest cut-off consistent with the work, wherever the lever must be placed to effect that object.

THE MASTER CAR BUILDERS' CONVENTION.

The members of the Master Car Builders' Association may, on the whole, feel very well satisfied with the results accomplished through the work of its committees during the past year and the actions of the convention at Saratoga. The reports of the committees upon the subjects assigned to them generally indicate much painstaking and intelligent effort to gather and digest for the Association all the available information existing in regard to their respective subjects. Some of the reports presented are of the highest order of merit, and are very creditable to the committees and the Association from every standpoint.

"Joint Inspection." The committee on this subject properly disregarded its name and worked according to its instructions, which were to prepare a supplementary set of interpretations and illustrations of the Rules of Interchange. Our space permits only of our giving the portions of the report the recommendations of which were finally adopted by the convention. Whether wisely or not the committee overstepped its instructions somewhat, and instead of offering interpretations of rules, the meaning of which is sometimes questioned, it proposed many changes in the existing rules, with the result that it found the convention in a very conservative frame of mind about changing the rules, and therefore much of its work was lost. The recommendations in regard to Rule 3, section (*u*), however, were adopted, and the detail instructions and illustrations will no doubt aid materially in the intelligent inspection and treatment of couplers in car interchange.

"Air Brake and Signal Instructions." As was predicted in our comments on this subject last month, the committee having the matter in hand returned the report of last year's committee modified in accordance with suggestions and careful study, but without changing the scope and general tenor of the instructions, which, as we then remarked, did not appear capable of very great improvement. The instructions are badly needed by a large majority of the men connected with the movement of trains, and the repair and inspection of cars and locomotives, and the convention acted wisely in adopting the report without further delay, and recommending that the instructions and rules be put in operation.

They can not be put into the hands of those for whom they have been arranged any too soon. It is quite likely that a year of application will suggest some changes, but this would be true if ten years were given to their consideration, and they should be withheld no longer from their legitimate purpose. Now, unfortunately, it is one

thing to put information in the hands of the ordinary train or engine men, and quite a different thing to get it into their heads. It goes without discussion that the desire of the members of the association is to have the instructions and explanations, arranged at the expense of so much time and labor, clearly and fully comprehended by the men to whom they will be issued. This being true, we would say that the only way by which this can be effectually accomplished is to distribute the instructions with the distinct understanding that an examination is to follow after a reasonable length of time, to explain any points not thoroughly understood, and for assurance that the instructions are read. Those who fail to do this, and follow it up with the examination, will probably not see any very startling betterments in the air brake service on their roads.

Employés connected with the movement of American railroad trains are just as intelligent and reliable as those who handle trains in any country in the world; generally speaking, they are more so, but they have a habit of putting time cards and instruction books into their pockets, or into their seat-boxes, and sparing themselves the mental effort of studying the same until necessity compels. Mental laziness is a disease not confined to train and engine men, but it is one that largely predominates among them, and in attempting to raise them by means of instruction to a higher efficiency they need the spur and the assistance of thorough, kind and intelligent examinations.

"Cast Iron Wheels." An excellent report was returned by the committee having this subject in hand. The committee properly went quite thoroughly into an examination of the respective merits of the plain and the contracting chill. From the meager replies received to the committee's circular of inquiry it is possible that insufficient data was obtained upon which to base reliable conclusions in some cases. The conclusions of the committee are substantially as follows: A majority of the roads replying to the circular of inquiry use the contracting chill, nearly all agreeing that with it foundry loss is decreased, but it is evident that a cheaper grade of iron cannot properly be used, and not less than 50 per cent. of new iron should be used. As regards uniformity and quality of product no conclusion is expressed. As to whether the percentage of guaranteed wheels requiring to be replaced has been modified by the contracting chill no conclusion is expressed, but further inquiry recommended. As to grinding and balancing wheels no data of importance was collected.

The general guarantee of wheels is four to five years in freight service and 60,000 miles in passenger service. Time allowed in annealing varies from six to nine days, the advocates of the maximum and minimum time not being confined to either plan of chilling. A model wheel should have five-eighths inch depth of chill. Well deserved praise is paid by the committee to the progressiveness of wheel makers for producing cast iron wheels weighing less than 600 pounds and guaranteed for 60,000 miles of the heavy, fast modern service for less cost than other car and locomotive castings. If in the year to come the committee receives the assistance and co-operation from members and wheel makers that it deserves, it is probable that its next report will contain much reliable information of value.

"Steel-Tired Car Wheels." This committee was to report upon the relative merits of solid cast and wrought centers and of plate centers bolted to hubs and tires. The committee did the best it could with the scant information it was able to gather. About the only conclusion arrived at in the report is that bolted centers are rarely entirely free from trouble with loose bolts, and that solid wrought spoke centers are the lightest and solid cast centers the heaviest. This committee, being continued, also need better treatment at the hands of members and wheel manufacturers.

"Metal for Brake Shoes." As we remarked last month in anticipation of the report of the committee on this subject, it had practically nothing to report, as its time was fully occupied on other subjects. A new committee will be appointed to take the matter up, and now, after a year's rest, perhaps some further definite results can be accomplished. Important as the matter is as considered simply from an economical view, the recognized importance of uniformity in airbrake cylinder piston travel demands, as a necessary adjunct, uniformity in the wear of brake shoes.

"Freight Car Truck Frames." The committee upon this subject reported that in answer to its circular of inquiry for information in regard to rigid and swing motion trucks it received forty-three replies, thirty-three favoring the rigid truck. The replies in reference to the Fox pressed steel truck were all favorable, but the committee considered the length of time of service of this type of truck too short to warrant conclusions.

It was suggested to the committee in convention that in the coming year it enter more thoroughly into the investigation of the respective merits of rigid and swing motion trucks. This is a good suggestion, and, if acted upon, will enable facts to be presented upon a matter about which there is much difference of opinion. There does not seem to be much difference of opinion in reference to the form of pressed steel truck named. It is generally agreed that it is a splendid construction, but that time is needed to demonstrate its merits.

"Automatic Coupler Standard and Limits." This was one of the most interesting reports presented to the convention, and its recommendations were all such as to secure greater safety and more uniformity in couplers. Possibly some of the conditions recommended for testing couplers will prove unnecessarily severe with further experience.

"Steam Heating and Ventilating of Passenger Equipment Cars." The report upon this subject was again confined to steam heating. In reading the report one is impressed with the fact that any device for use about railroads has small chance for success if it be of a complicated nature. Complications, even if efficient and for a worthy purpose are unwelcome intruders on cars or locomotives. The general tendency is toward simplification of all details. This is desirable from every standpoint because its results are always decrease in cost of repairs and increase in efficiency of service. This is a lesson worthy of careful study by all interested in apparatus for use on railroads. For them it is the secret of success, other conditions being equal.

Some objection was raised to the appearance of patented devices in the illustrations presented by the committee in recommending a standard location of train pipes. While these features necessarily appear in our reproduction of the illustrations, they will be eliminated in the cuts to appear in the proceedings of the convention.

Future committees should profit by the experience of the committee in this matter, as to be just to all the Association cannot allow departures from the rules in regard to patented devices.

"Standards of Efficiency for Airbakes." The prominence of the airbrake in the present stage of railroad development makes it eminently fit that the Master Car Builders' Association should take a very decided stand on the matter of the efficiency of brake apparatus and strongly insist that competing manufacturers of brakes improve their product to the highest attainable perfection before receiving the encouragement of patronage. The requirements of the tests proposed by the committee are reasonably fair, and are only such as modern practice demands. The Pennsylvania Railroad has rendered the Association a great service in offering to establish at the Altoona shops a set of brake testing apparatus for the Association and to aid in furthering the investigations. This postpones for the present the necessary consideration of a permanent testing laboratory owned by the association. As long as obliging neighbors will lend there may not appear any pressing necessity for such a plant.

"Standards of the Association." This was one of the most excellent and exhaustive reports ever presented to the Association. It reveals a very discouraging state of affairs as regards the use of the standards of the Association and it is very apparent that some such action as the committee recommends in the division of standards and recommendations, and a revision of the whole, eliminating all that have become dead letters, will be a sort of pruning that will infuse a fresher and healthier existence into those remaining.

THE WASTE OF POPPING.

The committee of the Master Mechanics' Association on compound locomotives expressed surprise at the result of its test to determine the waste of steam through popping. We quote as follows from the report :

Two three-inch pops were used on the dome. The waste from these when blowing off was found to be a surprisingly large quantity. Its amount was determined by causing the valves to pop for ten minutes [steam pressure being maintained] and taking measure of the water used. . . . The quantity blown off as above was found to be not less than three boiler gauges, giving an average of 168 pounds of water or steam wasted per minute popping.

It is really very fortunate that the committee made this test and found, to its surprise, that popping is as wasteful as it is. A somewhat similar test was made on the Chicago, Burlington & Quincy in 1889, the result of which appears on page 79 of Baker's "Manual of Instruction for the Economical Management of Locomotives," as follows :

By an actual test on a locomotive blowing off steam for four consecutive minutes for the purpose of the test, it was practically demonstrated that six cubic feet of water, or 336 pounds, was converted into steam and wasted. This was at the rate of 84 pounds of water per minute, or $1\frac{3}{5}$ pounds per second.

In this case it was found that in using one pop the waste was 84 pounds of water per minute; in the committee's test it was found that in using two pops 168 (twice 84) pounds were wasted per minute, certainly a remarkable agreement in results of independent tests made on different roads, and years apart.

The ordinary frequency of popping of locomotives is one of the worst methods of wasting fuel that is permitted to continue in practice, and it is, generally speaking, simply the result of carelessness or bad judgment on the part of enginemen. This also is proved by the committee's report, for with the two crews of "careful and observing men" selected to run and fire the engines during the test, "in many trips the boiler pressure was well kept up to the maximum and yet *no* steam was blown off," although "the engines were for long periods worked to their full steaming capacity and immediately shut off for equally long periods running down hill, or standing on side tracks." No doubt the men share the general lack of appreciation of the waste of popping, and their enlightenment concerning it would have a beneficial influence.

Mechanical Engineering at the University of Pennsylvania.

During the last several years the mechanical engineering department of this University has had its equipment considerably increased and several large rooms added for the accommodation of the rapidly increasing number of students. With increased facilities for instructing, the number of pupils has increased until now still more room is necessary and two large buildings are in course of construction. One is to be the engineering school, and will be four stories high and 100 × 50 feet on the ground.

On a portion of the ground floor will be placed the engines and dynamos for lighting the buildings of the University. This plant has been planned not only to be commercially successful, but to give the largest amount of opportunities for the students to study the peculiarities and test the efficiencies of the best types of engines and dynamos. It will be of 300 horse power, and it is intended to install four engines driving six dynamos of various types. The balance of this floor, about 2,000 square feet, will be devoted to the purposes of the Mechanical Engineering Department proper. The walls are of red brick, the floor granolithic, and the mill construction is to be used throughout.

On the second floor will be the remainder of the Mechanical Laboratory—a second room, 40 × 50 feet, in which will be installed much of the apparatus now in the laboratory, in the College Hall. On this floor also will be the office of the Department, three class and lecture rooms and the closets.

On the floor above will be located the drawing room—a room covering 2,000 feet of floor space—the electrical laboratory and photometric room, covering 1,600 feet of floor space, one class room and the assistant's room. On the floor above will be located the model room, in which will be placed the models of machinery of various kinds, kinematical models and a series of very fine plaster models cast by the students for patterns of their own make, showing the methods of using cores and making castings.

The entire room actually used from day to day in this building for instruction purposes in the Department of Mechanical Engineering will be about 15,000 square feet, as compared with about 4,000 feet in the present quarters.

The other building in course of construction is the boiler house. It is 100 feet by 50 feet, and when equipped will contain four shell and four sectional boilers. These boilers are intended to present to the students the best examples of modern stationary practice and will be so equipped that the values of different kinds of coal, different methods of setting, and different methods of burning coal can be experimented on under the conditions actually found in a commercial plant.

Among the men employed at the Bath Iron Works is a talented copper worker, named Robert Ducker, who is foreman of a copper shop. Recently he took a small copper cent, and hammered it into a miniature tea-kettle. The words "one cent" occupy all the space on the bottom. It has a swinging handle and a movable cover, while the kettle is hollow.

What is believed to be the largest aerolite ever known to have fallen is lying in the Caspian Sea, a short distance from the peninsula of Apsheron, having fallen June 2. So enormous is the aerolite that it projects 16 feet above the water, and, save for its fused black crust, which gives it the appearance of having been varnished, it has every appearance of being one of the usual rocky formations met with along the coast.

A new style of railway car seating material is being introduced in England. The seat is composed of minute steel wire rings compactly knit together, over which can be placed a thin layer of hair or pad of any material which is considered necessary. It is stated that the London & Northwestern Railway have already fitted 653 of these seats to their carriages and saloon berths and that the Great Eastern Railway have nearly 5,000 in use.

The articles of incorporation of the San Francisco & Salt Lake Railway, which has been mentioned as the first competing railroad extending out of California, have been filed in San Francisco by Alvinza Hayward, Daniel Meyer, William Babcock, E. L. Steele and E. F. Praston, as directors. The capital stock is $2,000,000. The road is to be completed within three years. There are to be two other corporations, one in Nevada, which will secure a Nevada subsidy, and one in Utah, reaching to Salt Lake.

Among the railroads that will have displays at the World's Fair is the Baltimore & Ohio. Models of rolling stock and motive power will be exhibited, as well as models showing the construction of the first fourteen miles of road, which were opened for traffic on May 24, 1827, from Baltimore to Ellicott Mills. The famous old engine "York," built by Phineas Davis, and the cars the engine hauled, will be shown on the strap iron track. A model of the engine "Grasshopper" and the first regular passenger coaches will be shown.

Personal.

Mr. J. W. Roberts has been appointed Master Mechanic of the Chicago & Southeastern, formerly the Indiana Midland.

Mr. J. H. Berry has been appointed Master Mechanic of the Cincinnati division of the Cleveland, Cincinnati & St. Louis.

Mr. S. M. Lobren has been appointed Purchasing Agent of the Minneapolis & St. Louis, vice Mr. W. B. Palmer, resigned.

Mr. J. G. Neuffer has been appointed Master Mechanic of the Baltimore & Ohio Southwestern, vice Mr. E. Evans, resigned.

Mr. W. P. Apgar has been appointed Superintendent of Parlor Cars of the Long Island road, with office at Long Island City.

Mr. W. J. Reilly, Purchasing Agent of the Buffalo, Rochester & Pittsburgh, has resigned and the office has been abolished.

Mr. William Graves has been appointed General Manager of the North Pacific road, in place of Mr. John W. Coleman, resigned.

Mr. W. T. Reed, Superintendent of Motive Power of the Chicago, St. Paul & Kansas City, is traveling abroad, and is at present in England.

Mr. Thomas Aldcorn, for many years Master Mechanic of the Hudson River division of the West Shore road, has resigned because of ill health.

Mr. William Findlay, Master Mechanic of the Brighton Beach Railroad, has been appointed Superintendent in place of the late Captain Morrow.

Mr. George W. Kenney has been appointed Master Mechanic of the Rutland division of the Central Vermont, with headquarters at Rutland, Vt.

Mr. John Howard, General Foreman of the Frankfort shops of the West Shore road, has been appointed Master Mechanic of the Hudson River division.

Mr. E. M. Roberts, Master Mechanic of the South Carolina road, has been made Superintendent of Motive Power, the office of Master Mechanic being abolished.

Mr. T. P. Bellows, formerly Superintendent of the Louisiana division of the Illinois Central, has been appointed Instructor and Traveling Engineer of that system.

Mr. James W. Fillmore, Manager of the Pacific Coast Railway, died at San Luis Obispo, Cal., May 21. He was born at Scranton, Pa., 42 years ago, and had been for several years connected with Western railways.

Mr. Henry Millholland, who has been connected with the mechanical department of the Pennsylvania Railroad, at Altoona, for a number of years, has accepted the position of Mechanical Engineer with the Gould Coupler Company.

Mr. M. E. Wallace, for the past two years Mechanical Engineer of the Gould Coupler Company, has resigned to become Chief Draftsman of the Chicago, Burlington & Quincy, at Aurora, Ill. For several years previous to his connection with the coupler company, Mr. Wallace was in the mechanical department of the Erie in various capacities.

Mr. Herbert Higgins, for ten years connected with the Northern Division of the Great Northern as General Foreman of Machinery, resigned recently to enter the service of the Atchison, Topeka & Santa Fe, at La Junta, Colo. Before his departure from the Great Northern the employés presented him with several pieces of silverware as a token of their esteem.

Mr. Joel H. Hills, an esteemed and well known resident of Newton, Mass., died at his country home in Cottage City, Mass., on June 22, of paralysis. Mr. Hills was 64 years old. He was connected with New England railroad enterprises, and for the last few years with the Granular Metal Company, of Boston. He was a man of very extensive acquaintance, public spirit and philanthropic disposition.

Mr. Ryan, Chief Draftsman of the C. B. & Q. Railway, at Aurora, Ill., has resigned to take a similar position with the Grant Locomotive Works. Mr. P. Arnot, who had charge of the old Grant Works at Paterson, will have charge of the machine and erecting shops of the works in Chicago; and Mr. G. Case, Foreman of the blacksmith shop at Paterson, will have charge of that department of the new works.

Mr. Charles M. Levey has been appointed Superintendent of the Iowa lines of the Chicago, Burlington & Quincy, with headquarters at Burlington, Ia., vice C. G. Wilson, deceased. Mr. Levey was General Superintendent of the St. Louis, Keokuk & Northwestern previous to his last appointment. He is 34 years of age, and began railroading November, 1872, on the Burlington under the late Thomas J. Potter.

Several changes in the motive power department of the Cleveland, Cincinnati & St. Louis are announced. Mr. F. M. Lawler is appointed Master Mechanic of the Chicago, Indianapolis and White Water divisions, with headquarters at Brightwood, Ind., vice O. H. Jackson, resigned. Mr. G. S. McKee, Assistant Master Mechanic at Indianapolis, is appointed master mechanic of the St. Louis division, with headquarters at Mattoon, Ill., vice F. M. Lawler, transferred.

Mr. Thomas Urquhart, who has been 24 years in the Russian railroad service, has accepted the position of General Manager of the Nevsky Engineering Works at St. Petersburg. The works build steamships, marine engines and locomotives, and employ about 2,000 men. Mr. Urquhart is well known to the railroad mechanical world from his writings about compound locomotives, and on the use of oil fuel for locomotives, which he successfully introduced on the Grazi-Tsaritsin railroad.

Mr. J. L. Greatsinger has been elected President of the Duluth & Iron Range. Mr. Greatsinger began his railroad career as a fireman in 1872, and about 1885 was appointed Master Mechanic of the Chicago & Indiana Coal Company. In 1888 he resigned that position to accept a similar one with the Duluth & Iron Range, continuing as Master Mechanic for two years. He was then promoted to the position of General Superintendent and held the latter position until March of the present year, when he was appointed General Manager. He still retains the title and duties of that office in addition to the new ones of President.

Mr. John L. Whiting, head of the brushmaking firm of John L. Whiting & Son, Boston, died very suddenly at his home, 16 Bernick Park, Sunday morning, June 5. Apoplexy was the cause of death, which occurred after an illness of only a few minutes. Mr. Whiting was one of the best known and highly respected men identified with the paint trade in the United States. He started in business 28 years ago, with absolutely no capital. A relative loaned him a government bond for $1,000, which he used as collateral on which to borrow money from the bank. From that small beginning the largest brush business ever carried on by one firm has been built up.

Mr. C. G. Wilson, Superintendent of the Iowa lines of the Chicago, Burlington & Quincy, was drowned recently while examining the extent of damage done by a washout. He was walking along the track when he slipped and fell into a deep hole filled with water. All efforts to resuscitate him were unavailing. Mr. Wilson was 42 years of age and leaves a widow and two children. He entered the service of Chicago, Burlington & Quincy in 1876, as clerk at Quincy, Ill. In 1880 he was made agent in East St. Louis, in which position he remained until October, 1887, when he went to Chicago as Assistant General Freight Agent. In July, 1888, he was made Superintendent of Chicago freight terminals, and in July, 1890, was promoted to the position of Superintendent of the Iowa lines, with headquarters at Burlington.

Mr. Sidney Dillon, formerly President of the Union Pacific, died at his home in New York on the morning of June 9, after an illness of about three months. Mr. Dillon was born at Northampton, N. Y., May 12, 1812. His parents being poor he grew up with but little education, and when but a child was employed as a water boy on the Mohawk & Hudson Railroad then constructing. While he was still earning only $1 a week as water boy on the Mohawk & Hudson Railway he excited the ridicule of his associates by claiming that he would one day be "richer nor any squire" whom he knew. By slow and tedious stages he rose to be an overseer in the construction of the Boston & Providence Railroad and then foreman upon the Stonington railroad and finally manager in some heavy rock works near Charlton, on the Western Railroad of Massacusetts. From this point his upward career was uninterrupted and rapid. His great skill in organizing labor and his sound judgment in attempting as much and no more than was just proportionate to his means for carrying it out, and his unremitting industry and perseverance, brought him success. In 1865 he became interested in the construction of the Union Pacific Railroad, of which company he was a director from its organization until his death. In his vast contracts he acquired a large fortune. In 1869 he drove the last spike at the connection of the Union Pacific and Central Pacific railroads at Promontory Point. He became President of the Union Pacific in 1879. In 1884 he was succeeded by Mr. Charles Francis Adams, but again in 1890 Mr. Dillon became President. At the last election he retired. It is estimated that the railroads that he built aggregated over 25,000 miles.

The Argentine Great Western Railroad recently had all its locomotives altered to burn petroleum instead of coal. These changes had no more than been completed before the announcement came that the Mendoza oil wells, upon which the road expected to depend, had given out. The resulting loss, if such is the case, will be great.

Since Guatemala has received assurances that the foreign loan arranged a couple of years ago is to be carried through successfully, the Guatemalan Congress has appropriated $1,500,000 toward the commencement of the Northern Railroad which is to connect the capital with Livingston on the Atlantic coast. When completed the city of Guatemala will thus be brought within five days of New York.

Articles of incorporation of the Jalisco Pacific Railroad Company were filed at Denver May 22. The company proposes to establish a railroad from Manzilla, in the State of Colima, to Guadalajara, in the State of Jalisco, Mexico. The capital stock is $10,125,000. The same corporation also filed articles for the Zacatecas & Potosi Railroad Company to build from Zacatecas to San Luis Potosi, with a capital stock of $2,250,000.

Railroad President: "That was a bad accident, but it might have been a thousand times worse. Suppose those cars had taken fire! Phew! Why didn't they?"

Superintendent: "A lazy brakeman had let the fires go out."

President: "Raise his salary."

In answer to the question what is the average "life" of a New York and Chicago limited train, a Pennsylvania Railroad officer says that it is about six months. These trains are not "patched up" with a new car occasionally, but are always sent out in complete trains from the shops, and when this is done the train which is taken off to give place to the new one is either taken in the shops for repairs or assigned to some less distinguished run.

At a special meeting of the stockholders of the Chicago Great Western Railway Company, the lessee of the Chicago, St. Paul & Kansas City road, a proposition to increase the capital stock from $90,000,000 to $100,000,000 was adopted. The proceeds from the sale of the additional stock will largely be used, it is said, in improving the road and in buying new equipment. It is the purpose of the directors to make their road equal in every respect to the best in the country, and to equip it with rolling stock of the latest pattern.

When you order a circular saw, always state as nearly as possible the speed at which it is to run. Saws are all hammered to certain requirements, unless otherwise ordered. A saw made for a speed of 700 revolutions a minute will cause trouble if the attempt is made to run it at half that speed. Doubtless one-half the orders sent to the manufacturers make no reference to this, hence much dissatisfaction on the part of buyers. It is a fact that the majority of circular mills are speeded to low. This doubtless accounts for much poorly manufactured lumber as well as for much of the trouble with saws. *Harwood.*

An official notice has been published announcing the opening of the new Cape Government railways in South Africa. It says the main trunk lines from the colonial seaports to the Transvaal railways will be opened for general goods traffic to Kronstad, in the Orange Free State, on Feb. 20. Kronstad is 80 miles from the Vaal River and 115 from Johannesburg. As Kronstad will be the terminus for a very short time only, no special provision will be made by the department for storing "through" goods there. The line is now opened for goods traffic to Valjoens Drift, 35 miles from Johannesburg. Ample transport will then be available.

A bad accident caused by a landslide occurred June 24, at Monte Sasso, on the line of the Bologna & Florence Railway, in Italy, which runs through the Apennines, and is one of the most boldly constructed lines in Italy. A large area of land on the mountain side slid down on the houses below, completely burying them. Some of the people managed to escape, but many were killed or injured. The work of rescue is being conducted as rapidly as possible. The railway is covered with earth and rock to a great depth and all traffic is consequently supended. This line is peculiarly liable to interruptions from landslides. In 1851 the village of Vigo, one of the stations on the road, was completely destroyed by earth sliding down from Monte Vigese.

During the 10 years beginning with Jan. 1, 1882, and ending with Dec. 31, 1891, a total of 55,081,542 tons of coal and coke were received in Chicago, comprising 15,299,149 tons of anthracite, 6,072,458 tons of coke and 31,719,935 tons of soft coal, the latter being shipped to the amount of 15,059,089 tons from Illinois mines, 8,969,794 tons from Indiana and 9,681,052 tons from Ohio, Pennsylvania, West Virginia and Kentucky mines. Subtracting the amount reshipped to interior points during the 10 years, 12,507,943 tons, it is found that 42,573,599 tons were actually consumed in Chicago, and of this enormous amount anthracite represents 9,719,753, coke 3,537,497 tons and soft coal of all kinds 29,286,349 tons, or 69 per cent. of the total consumption.

The General Manager of the Chesapeake & Ohio has issued the following order, under date of June 10:

"The passenger trains of this line are equipped with the Westinghouse quick-acting automatic air brake, the Westinghouse train signal, and Janney couplers. It is thought proper that all cars, including special and private cars, offered for movement in the passenger trains of this line, should be similarly equipped. Cars not equipped with the Westinghouse air brake, the Westinghouse air signals, and Janney couplers, or a coupler of the Master Car-Builders' type, which will work in close connection with the Janney, are not to be moved in the passenger trains of this line without special permission from the President or General Manager. Cars equipped with the 'Janney Hood' will not be accepted."

Communications.

Reverse Lever Quadrants.

Editor National Car and Locomotive Builder:

Referring to your issue of June, 1892, I notice an article entitled "Close Notched Locomotive Quadrants," also an editorial on the "Reverse Lever Quadrant."

In the former article you illustrate the standard reverse lever and quadrant of the C., B. & Q. R. R., and state that this was designed by the C., B. & Q. I beg to contradict this statement and submit herewith two blue prints dated May, 1883, of identically the same reverse lever and quadrant, dimension for dimension, which was designed by the writer in 1882, when mechanical engineer of the West Shore. Prints of this reverse lever and quadrant were furnished the C., B. & Q. in June, 1883, from which they made slight modifications as to radius of quadrant, etc., to adapt it to their existing locomotives.

In these two articles you seem to infer that this fine tooth reverse lever and quadrant is a new thing; this identical lever and quadrant were applied by the writer to 200 locomotives built for the West Shore by the Rogers, Baldwin, Dickson, and Schenectady Locomotive Works. You state in your editorial that not one of our locomotive works have turned out a quadrant that properly accomplishes the purpose for which it is designed. We would here state that the reverse lever and quadrant in question have been the standard used by the Brooks Locomotive Works for the past four years, and that it has been applied to every engine built by them during that time, with the exception of a few light engines, mostly switchers.

With regard to the other style of fine tooth quadrant you illustrate as used by the Southern Pacific, this latch and quadrant is identically the same as that applied by the writer to a few of the first locomotives built for the West Shore, which were equipped with the old style reverse lever and quadrant; all that was necessary to make the change upon these engines was to make a new latch for the reverse lever and a new quadrant, the pitch of the teeth in the latch and quadrant being the same as that used upon the single bar quadrant as first designed.

You will notice on inclosed prints that the quadrants are 54 inches radius; they are made in this way purposely, so as to secure the greatest possible length of quadrant and consequently the finest possible movement of the link block for each tooth in the quadrant. The Brooks Works have several different styles of latch boxes for these fine tooth quadrants, and use them for different radii, from 24 inches up to 66 inches and pitches from $\frac{1}{2}$ inch to $\frac{3}{4}$ inch, the latter of which having three teeth is the standard for switchers.

JOHN PLAYER,
Mechanical Engineer Brooks Locomotive Works.

New Design of Boiler.

Editor National Car and Locomotive Builder:

In reference to the design for a double barreled locomotive boiler, illustrated in the May NATIONAL CAR AND LOCOMOTIVE BUILDER, I desire to state what, in my opinion, are some of its objectionable features. The boiler is somewhat similar to the Flaman boiler recently built by the Eastern Railroad of France, excepting that on the latter no gas envelops the upper barrel. I think it would be a mistake to attempt this, for after increasing the number of tubes by filling the lower barrel with them, the heating surface of tubes would be so large that the bulk of increased economy would be obtained there, and the later additional heating due to the gas surrounding the upper barrel would not pay for the complicated construction necessary in making a tight gas chamber and in the draft appliances.

In fact, the successful steaming with such an indirect course is very doubtful, and the effect of it on steaming would more than wipe out the additional evaporation expected from it. Another principal objection I have to the plan, whether the upper barrel is heated by gas or not, is the small evaporating surface on the water line. This would be somewhere in the upper barrel, and the ebullition from such a small surface would be so violent that there would, I think, be priming to an unusual degree, when the boiler was forced, as our American engines demand.

I don't see exactly how such a boiler would be any better for bad water than the regular form. The additional tubes would become scaled the same as others, and more of them to be taken out and cleaned. I do not feel very hopeful about this design, and I have given you a few reasons as they now occur to me. CONSERVATIVE.

Editor National Car and Locomotive Builder:

I noticed a new design of locomotive boiler illustrated on page 75 of the May number of the NATIONAL CAR AND LOMOTIVE BUILDER.

I do not think that the object which this boiler aims at accomplishing would warrant the introduction of such costly remedy. Its merits would lay in being a superheater and means of preventing priming. When it is desired to accomplished both objects named I believe it can be done in a cheaper way. I think there would be trouble experienced in managing the draft to apply to both boilers, and I also think there would be serious flue trouble in the top boiler. MASTER MECHANIC.

Master Car Builders' Convention.

(Continued from page 107.)

While what has been outlined is a departure from the usual course pursued by railroads, we believe it is warranted under the national and state legislation now going on, for such action will certainly have a tendency to foster and encourage spurious and useless devices. Congress will not trouble itself about keeping inefficient devices out of railroad service, and it would, therefore, seem wise that the railroad companies should protect themselves by a departure such as your committee has outlined.

GODFREY W. RHODES, EDWARD B. WALL, GEORGE GIBBS, *Committee.*

The report was received and the committee continued.

Appreciation of the excellence of this report was also shown by applause, and the chairman, Mr. Rhodes, was requested to give any additional information he possessed. He complied as follows:

During the past winter, in appearing before a committee representing the State Commissioners, there was one curious condition of things existing. The representatives of the railroads were advocating the use of certain safety appliances. The Commissioners wanted to require the use of those same appliances, and yet the Commissioners and the railroad companies could not agree, simply because the Commissioners wanted to make it obligatory and the railroad representatives did not feel authorized to say that they should be used yet although they said they were using the devices. Now, one could see that the Commissioners could not reconcile the conditions, where the railroads were advocating the use of certain devices, and yet when the Commissioners say, "We are going to propose that everybody shall use them," the railroads say, "No, we do not want them." I think that the reason for the apparent paradox really was that the Commissioners did not appreciate the crude state in which these safety appliances still are. In the matter of the coupler, while we feel that we are on the proper track and have got the right coupler, we do not yet feel that it is perfect. The same is true of other safety appliances, and it applies, I think, to the airbrake. The committee has said that, "While what has been outlined is a departure from the usual course pursued by railroads, we believe it is warranted under the national and state legislation now going on; for such action will certainly have a tendency to foster and encourage spurious and useless devices."

Now I propose to show some of the difficulties that exist now among the brakes that are on our cars. In the first place we will take the results obtained from five triples of different construction taken off cars passing over our line. I have not thought it wise to give the names of the triples, and so I have lettered them.

TABLE NO. 1.

Triple.	Time in seconds.
A	17
B	36
C	42
D	61
E	66

These tests are made with only one triple of each manufacturer, and cannot be said to represent an average.

Our committee have recommended that the charging time of auxiliary reservoirs under certain conditions, be not less than 45 secondsand not greater than 60 seconds. The condition under which this test was made was not precisely the same as a test which the committee made some time previously. On the left I have lettered the five triples. On the right I have shown in seconds the time which it took to charge the auxiliary reservoirs to 60 pounds. The condition of the test was this: The main reservoir on train pipe pressure being 90 pounds, the pump being shut off. The length of the pipe was 9 feet. The main reservoir was 19 inches in diameter by 42 inches long. The time is given for these conditions. The D and E triples are about correct; the others are wrong.

The effect of having the A, B and C triple at the front of the train intermixed with other triples would be the charging of front reservoirs first, and when the brakes equalized in the rear reservoirs, on account of the higher pressure in the front reservoirs, the brakes would go on again. This is a simple test which any one can make, and is a test which manufacturers of triples ought to be very careful about.

With the same triples we attempted to compare the service action and emergency action. The results are given in tables 2 and 3, marked "Service" and "Emergency" respectively.

TABLE 2.

Service.

Dia. of opening.			Triples.
1	$\frac{1}{64}$	Service application commences	C, E and D
9	$\frac{3}{64}$	" " "	B
25	$\frac{5}{64}$	" " "	A

Range.

$\frac{2}{64}$	A
$\frac{6}{64}$	C
$\frac{7}{64}$	E
$\frac{8}{64}$	D

Emergency.

(3)

Dia. of Opening			Triples.
36	$\frac{9}{64}$	Emergency application commences	C
49	$\frac{11}{64}$	" " "	A
64	$\frac{8}{64}$	" " "	E
81	$\frac{9}{64}$	" " "	D

(5)

$\frac{10}{64}$	Full emergency at once		A
$\frac{11}{64}$	"	" " "	E
$\frac{12}{64}$	"	" " "	D
$\frac{14}{64}$	"	" " "	C

Range.

(6)

$\frac{3}{64}$	A, E, D
$\frac{4}{64}$	C

I will refer, first of all, to the service test. The same length of piping was used as in the other case. We took brass discs (a number of them, some 17 to 20), and in the center of the disc were openings, starting at a 64th diameter and increasing by 64ths. The discs were put at the connection with the engineer's valve, and, having secured 70 pounds in the auxiliary reservoir, all the air was allowed to escape from the train pipe as rapidly as it might through the opening. We found that triples C, E and D began to apply with the $\frac{3}{64}$th opening. Triple B did not apply until we put a $\frac{3}{64}$ths opening.

Now, when I speak about this opening I want to be understood as referring to the diameter expressed in 64ths. Triple *A* did not go on until the diameter was $\frac{5}{64}$ths.

At the left of the 64ths you will observe the figures 1-9-25. Those show the ratio of the areas to each other.

We desired to determine when the quick action began to appear, so as to get the range of the service feature of the brake. Of course, the wider that range was the less difficulty there would be from the quick action going on when not wanted. In determining when the quick action began to appear the dial of the gauge was watched, and when the arm would move and kick on at the last part of the stroke we considered then we had reached the quick-action feature of the brake.

The first one to show the quick-action feature was C, at $\frac{6}{64}$ths, diameter measure. The next was A, at $\frac{7}{64}$ths. The next was E, at $\frac{8}{64}$ths. and last was D, at $\frac{9}{64}$ths.

Now, by deducting one from the other, we get the range of the service feature of the brake, given in Table (2).

The one with the lowest range is A, with $\frac{2}{64}$ths. The next is C, with $\frac{4}{64}$ths, the next E, with $\frac{6}{64}$ths, and D, with $\frac{8}{64}$ths. The last named is, of course, the safest triple to use. Triple "A" has but very little service feature at all. It is nearly all quick action.

In determining the range of the quick action, or the range of the emergency feature of the brake, we got quite interesting results. Table (3) shows the diameters of the openings that will cause quick action at once when the valve is opened. A gets very quick action with a diameter measuring $\frac{11}{64}$ths, E with a diameter measuring $\frac{8}{64}$ths, D with a diameter measuring $\frac{9}{64}$ths, and C with a diameter measuring $\frac{9}{64}$ths.

Now the range is obtained in the same way as before. We find that A, E and D have a range of $\frac{3}{64}$ths, that is to say, practically alike. And A, which showed very little service feature, shows a good quick-action feature. The conclusion is that A is almost entirely a quick-action brake; that there is no service feature about it. I can speak of that confidently, because that is the condition of that brake. It is not a joint service and quick-action. It is almost a quick-action by itself, and disastrous results would follow if placed with others in a train. If one of those brakes went on partially slow action and then followed with the quick action, as it would be sure to do, it would bring about bad results.

But, perhaps, the most interesting case is that of C. We find that in place of C getting its quick action with a short range it does not get it until the diameter is increased $\frac{6}{64}$ths; in other words, it is not strictly speaking a quick-action brake. It is just the reverse of "A"; that we can also speak of confidently, not only on the one test, but it has proved to be so in service.

A triple such as "C" is will be a very tardy quick-action brake, and in certain lengths of train the quick action feature would die out entirely. Even in a 50-car train the quick-action feature would die out entirely.

These experiments show a way by which the sensitiveness of the service feature of triples and the sensitiveness of the emergency feature of triples may be measured and gauged pretty accurately. The committee think by following this line of investigation that we will be able to determine a measure for graduating brakes. When that is accomplished in place of having all the experimenting going on in the cars that are passing over these roads, they can be made in the shops and not put out in service until the brake is perfected.

Now, I want to refer again to what I said at the commencement. Our State Commissioners and our legislators do not realize these things. They say: "It is good enough—use it." The reason that railroad people hesitate with these same matters and do not wish to have obligatory legislation is because they know that they are not perfect, and until we get some means of determining accurately that what we have got is good there is going to be more trouble than good obtained by forced legislation. (Applause.)

The report of the committee was received and the committee continued.

The committee to report on subjects next year reported that in their opinion the Executive Committee had better select the subjects for 1893. Adopted.

The Committee on Nominations had reported for President E. W. Grieves; First Vice-President, F. D. Casanave; Second Vice-President, J. S. Lentz; Third Vice-President, T. A. Bissell; Treasurer, G. W. Demarest; Executive Committee, J. T. Chamberlain, G. W. Rhodes, Pulaski Leeds and J. C. Barber.

The Secretary was authorized to cast the vote for the officers as nominated, which was done, and the officers therein named were elected.

The officers elect responded in a few well chosen words of thanks for the confidence and honor conferred by the election.

For the place of meeting next year the following cities were mentioned: Saratoga, New York City, Detroit, Milwaukee, Put-in Bay and Old Point Comfort, the choice being left to the committee.

On motion by Mr. Leeds the thanks of the members were tendered the retiring President for the able and efficient manner in which he had conducted the business of his office, to which he very pleasantly and gracefully responded.

The convention then adjourned.

Vestibule trains with buffet cars are being introduced in Germany, as a result of a visit to this couutry made in 1890 by Mr. von Borries and Mr. Bute, of the German Railway Department. It is reported that the first two have been running since May 1 between Berlin and Cologne, and the next two since June 1 between Berlin and Frankfort. Another train will be put on between Berlin and Cologne.

A ten-wheel Schenectady compound locomotive is to be put in service on the Pennsylvania Railroad, which has hitherto used only eight-wheel and consolidated engines as road locomotives. The total weight of the locomotive is 138,000 pounds, and it is intended to draw the fast passenger trains over the mountain grades west of Altoona. Several eight-wheel engines with 78-inch drivers and 19-inch by 24-inch cylinders for the same road are also nearly completed at the Schenectady works. At the company's Fort Wayne shops six ten-wheel engines are being built. It is intended to run two each of these on the Pennsylvania, Pittsburgh, Fort Wayne & Chicago and Panhandle lines for hauling heavy and fast passenger trains.

What bids fair to be rather an interesting experiment from a shipbuilding point of view is about to be realized in Norway. It has been decided, provided the necessary funds can be raised, of which there can hardly be any doubt, to construct a Viking ship for the Chicago Exhibition on the exact lines of the famous Gogstad Viking ship. The dimensions are also to be the same as those of the original vessel. A number of experienced captains have given as their opinion that the proposed vessel can cross the Atlantic without any risk during the months of April to July. The meeting in mid-Atlantic of an old-fashioned Viking ship and one of the "greyhounds" of the present day would be rather an interesting sight.

Exhibits at the Master Car Builders' and Master Mechanics' Conventions.

There was a noticeable decrease in the number of exhibits at this year's convention of the railroad mechanical associations as compared with those of the last two years. But what was lacking in number was more than compensated for in the good quality and sensible design of those articles of manufacture shown. The rapid adoption of the M. C. B. type of coupler has worked a benefit to inventors in discouraging the presentation of types of coupler radically different and hopelessly impracticable. So, while nearly all the varieties of the vertical plane coupler were represented, "fool" couplers and coupler cranks were scarce although not altogether absent.

Most of the exhibits, also, were new or had new special features, and few appeared that had been shown in former years.

The following is a list of the displays:

The American Steel Wheel Company, of New York, exhibited a section of one of its all steel car wheels which had run 122,860 miles on the Central Railroad of New Jersey, with no perceptible flange or tread wear.

American Car Door Company, Indianapolis, Ind., car door; represented by E. J. Eames, J. Wagner.

American Coupler Company, Syracuse, N. Y., car coupler; represented by C. F. Springer.

Allison Manufacturing Company, Philadelphia, Pa., model of dump car; represented by H. Albertson.

American Machinery Company, Detroit, Mich., universal trimmer; represented by J. W. Oliver.

F. W. Bird & Son, of East Walpole, Mass., had a section of the Neponset waterproof car roofing.

The E. L. Bushnell Company, of Poughkeepsie, N. Y., had rattan and plush car seats with its system of car springs under them.

R. Bliss Manufacturing Company, Pawtucket, R. I., passenger car platform gate; represented by J. B. Goodwin.

The Buckeye Automatic Coupler, of Columbus, O., showed six couplers and also exhibited fine malleable iron castings.

Blakeslee Manufacturing Company, Cleveland, O., photographs and forgings; represented by R. C. Hallett, J. R. Blakeslee.

Bowers Manufacturing Company, Newark, N. J., threeply embossed decorated veneer ceilings; represented by Robert A. Bowers.

Bradley & Company, Syracuse, N. Y., models of cushioned hammer; represented by J. Lucas Smith.

Baker, B. F., Ballston Lake, N. Y., expanding bucket for pumps.

Burrowes Car Shade Company, Portland, Me., car shades; represented by E. F. Burrowes, Geo. H. Davis.

Boyer Railway Speed Recorder Company, St. Louis, Mo.; represented by H. J. Decker.

Blackall, R. C., Albany, N. Y., Trojan oiler for all bearings of locomotives.

R. A. Cowell, Cleveland, Ohio, car coupler.

The Coburn Trolley Track Manufacturing Company, of Holyoke, Mass., had a car door running on a trolley track.

The Crosby Steam Gauge & Valve Company, of Boston, had gauges, valves, indicators, chime whistles, etc.

A fine model of the Chicago grain door was shown by Edward A. Hill, the secretary of the Chicago Grain Door Company.

Coolbaugh & Pomeroy, of New York, had the new Boies wrought iron center steel tired wheel, the Lukens boiler plates and the Cambria Coffin process axles.

The Consolidated Car Heating Company, of Albany, N. Y., had, as usual, a magnificent and attractive display consisting of a mogul locomotive three feet long, under steam jacked up and running and engaged in heating a train of four model cars, showing the multiple circuit system consisting of the drum system, the disc drum system, the commingler system and the commingler storage system. Also full size Sewell and McElroy couplers.

A model bearing the inscription "something new," "a positive coupler in all its movements," was shown by Mr. R. A. Cowell, of Cleveland, O.

Car Ventilator Company, Philadelphia, Pa., Pancoast ventilators; represented by J. D. Wilson.

Congdon Brake Shoe Company, Chicago, Ill., cast steel car coupler; represented by F. W. Sargent.

Cushioned Car Wheel Company, Indianapolis, Ind., cushioned car wheel; represented by P. F. Leach.

Chapman Jack Company, Cleveland, O., jack screws; represented by C. T. Johns.

Columbian Metallic Rod Packing Company, Philadelphia Pa., piston rod packing; represented by W. E. Myers.

Philip Carey Manufacturing Company, Cincinnati, O., model of car roof; represented by L. H. Taylor.

R. S. Chase, Elsdon, Ill., roller side bearings.

The Damascus Bronze Company, of Pittsburgh, had car and locomotive bearings.

Mr. Waldo, who represents the Detroit Lubricator Company, had a neat exhibit of sight-feed lubricators, rod and guide cups, Garfield injectors for locomotives, etc.

The Drexel Railway Supply Company, of Chicago, exhibited the Drexel coupler and the Drexel journal box lid; the latter article has had a highly satisfactory sale since it was placed on the market by the Drexel Company.

Devlin, J. C., Memphis, Tenn., car coupler.

Dreher Manufacturing Company, New York, boiler compound; represented by A. Lichenheim.

Deitz, Henry, Denver, Col., drawbars.

Empire Car Coupler Company, New York, car coupler; represented by Thomas Aldcorn.

Erie Car Heating Company, Erie, Pa., full size car heating plant; represented by J. B. Hicks and J. R. Drozeski.

Ensign Manufacturing Company, Huntington, W. Va., models of snow plows; represented by J. W. Russell.

Ewall Iron Company, St. Louis, Mo., samples Tennessee bloom firebox and flange iron.

Edwards, O. M., Syracuse, N. Y., improved car windows; represented by Col. H. A. Wheeler and E. N. Gilfillan, of Chicago.

Geo. A. Ferguson, Greenville, Tex., car coupler, pipe coupler, metal tie and rail fastening and guard rail fastening.

Farnsworth & Co., Uthieville, Pa., automatic car brake; represented by Abraham Nevling, Enoch Farnsworth.

The Schoen Manufacturing Co., of Pittsburgh, had pressed steel center plates, stake pockets, etc., and a 60,000-pound, pressed steel journal box which is a fine piece of work; also the Schoen pressed steel draft rigging.

A. French Spring Company, Pittsburgh, Pa., oil box lid, dummy couplings; represented by Geo. W. Morris, H. J. Geriken, D, C. Noble, L. C. Noble.

George L. Fowler, New York, locomotive ash pan.

Fairbanks Company, Boston, Mass., valves and steam specialties; represented by A. G. Paul.

Fox Solid Pressed Steel Company pressed steel trucks; two cars on N. Y. C. & A. R. R. tracks; represented by James Brady, W. O. Jacquette.

Falls Hollow Staybolt Company, Cuyahoga Falls, O., hollow staybolt and hollow staybolt iron; represented by C. M. Walsh and Wm. H. McElroy.

The Gold Car Heating Company, of New York, had the Gold storage system, steam trap, pipe valve and the Gold interchangeable couplings with the Sewall & Gibbs; also the Gold trapped coupling on overhead system and the Gold double coil.

J. B. Graves, of Cedar Rapids, Ia., exhibited a link and pin coupler.

Geometrical Drill Company, Boston, Mass., geometric drill; represented by C. F. Barker, W. J. Smith.

Chas. Grambe, Dalton, Pa., car coupler.

Gilmour Manufacturing Company, New York, asbestos pipe covering and jacketing; represented by A. F. Conkling.

Greene, Tweed & Co., New York, pipe wrench and ratchet drill; represented by Chas. T. Burr.

Hartford Woven Wire Mattress Company, Hartford, Conn., car seats, mats; represented by C. A. Leighton.

W. Haskell King Company, New Haven, Conn., sash support, anti-rattler and bolt; represented by W. Haskell King.

Hinckley Brake Company, Trenton, N. J., brake slack adjuster; represented by H. Hinckley, F. B. Stevens, Jr.

Hinson Car Coupler Company, Chicago, Ill., car couplers; represented by J. E. Forsyth; General Manager, F. G. Kammerer; President, E. R. Merrell.

Hayden & Derby Manufacturing Company, New York, metropolitan injector.

Hughes Car Heating and Ventilating Company, Toronto, Ont., illustrations of heating and ventilating system; represented by S. Hughes.

The Ide Wrench Company, of Troy, N. Y., had several of the Ide chain wrenches, which attracted much attention.

Ingferringsworth & Co., Uthieville, Pa., automatic car brake; represented by Abraham Nevling.

Robt. B. Johnston & Co., of New York, had car and locomotive concave springs.

The H. W. Johns Company, of New York, had asbestos packing, etc.

The Jewett Supply Company, of Boston, Mass., exhibited Jewett's anti-friction side bearings.

Jenkins Bros., of New York, had valves, packing, etc.

R. M. Gilmore & Co., of New York, had asbestos packing.

E. M. Judd, of Wallingford, Conn., car coupler.

C. C. Jerome, Chicago, Ill., metallic packing for piston, valve stem and air pump stuffing boxes; represented by Frank P. Smith.

The Knitted Mattress Company, of Canton, Mass., showed its patent padding for car seats, backs, dining cars, sleepers, etc.

Messrs. Edward I. Frost and Charles L. Sullivan explained the many merits of the Kewanee rectangular brake beams, the passenger beam weighing 75 pounds and the freight beam 60 pounds, meeting all the M. C. B. requirements.

Kegan & Halpin, New York, Wells light and tire setting machine; represented by John Sherry, M. P. Halpin.

Leach, H. L., Boston, Mass., sand-feeding apparatus for locomotives; represented by H. L. Leach, H. L. Leach, Jr.

Loomis, Horace N., Hightstown, N. J., metallic weather strip applied to window sash.

Lochner & Randall, Adrian, Mich., model of automatic car brake; represented by L. T. Lochner.

The Marden Car Brake Company, of Boston, had an improved Marden steel brake beam.

Morris Box Lid Company, Pittsburgh, Pa, oil box cover; represented by George W. Morris.

The Massachusetts Mohair Plush Company, of Boston, exhibited a variety of pieces of 24 and 28 inch car plushes.

The Meneeley Bearing Company, of West Troy, N. Y., exhibited full size tubular anti friction journal bearings; represented by C. D. Meneely, L. V. Feaney.

The National Hollow Brake Beam Company, of Chicago, exhibited several beams, and distributed pamphlets, circulars, etc.; represented by C. B. Leigh, A. J. Farley, F. G. Ely.

The Morton Safety Heating Company, of Baltimore, had a half size model of a passenger car piped with their system of car heating, also sections of piping.

The Moran Flexible Steam Joint Company exhibited the Moran steam joint and the Moran automatic barrel filler, the latter a new device.

McGuire Manufacturing Company, Chicago, Ill., photographs of street railway trucks; represented by W. J. Cooke.

The National Lock Washer Company, of Newark, N. J., had lock washers and lock nuts.

A. O. Norton, of Boston, had the Norton improved ball bearing jack in several sizes.

The New York Car Wheel Works, of Buffalo, showed ground chilled car wheels.

The Nathan Manufacturing Company, of New York, had the new Nathan injector; also some of its older devices.

The National Malleable Castings Company, of Chicago, Cleveland and Indianapolis, had a new car door fastener, malleable center plates and the Butler drawbar attachment.

National Car Door Company, Decatur, Ill., the Decatur car door; represented by A. Stevens.

National Supply Company, Baltimore, Md., car replacer; represented by J. C. Norwood, Howard Carlton.

Northwestern Equipment Company, Chicago, Ill., Kenawee rectanglar brake beam; represented by Charles W. McCorkle.

Oliver Iron and Steel Company, Pittsburgh, Pa., samples of iron and steel forgings.

A new Chicago coupler, manufactured by the Oakes Automatic Car Coupler Company, 300 Michigan street, Chicago, was shown by Mr. Oakes.

Olmstead & Wemple, Schenectady, N. Y., car coupler; represented by J. V. Wemple.

Mr. F. W. Parsons, of Cleveland, O., exhibited a full-sized Vulcan coupler. It was the first coupler he has turned out and is hardly as yet on the market.

Pratt & Letchworth, Buffalo, N. Y., Pooley automatic coupler.

Pantasote Leather Company, New York, artistic Pantasote leather; represented by B. W. Wilkins.

Peerless Rubber Manufacturing Company, New York, rainbow packing, rubber good; represented by C. H. Dale.

Perfected Coupler Company, car coupler and draft gear represented by J. A. Hinson.

Putnam & Stiles, New York, adjustable car step; represented by A. H. Stiles.

Pero Car Coupling Company, New York, model of car coupler.

Pennell, Arthur, Kansas City, Mo., water purifier.

Putnam, G. V., Gloversville, N. Y., cut-off for steam engines.

Positive Lock Washer Company, Newark, N. J., nut locks; represented by Stephen D. Barnett.

Ross Valve Company, Troy, N. Y., reducing and gate valves; represented by J. C. Ross, William Ross.

The Smillie Car Coupler Company of New York, had two Smillie couplers.

The Simmonds Rolling Machine Company, of Fitchburg, Mass., had a fine display of rolled steel specialties.

The Standard Car Coupling Company, of Troy, N. Y., had several of their couplers.

The Safety Car Heating and Lighting Company, of New York, had a Pintsch compressed gas tank, to which was attached two of their latest car lights, as from a car roof. These were in the hotel office, and in view of the rapid adoption of this light on the railroads of the country, much interest was shown in the device.

Schoen Manufacturing Company, Pittsburgh, Pa., pressed steel center plates, oil box, stake pockets, draft rigging, brake beams: represented by Chas T. Schoen, W. H. Schoen.

Shoemaker Automatic Car Coupler Company, Philadelphia, Pa., model of automatic car coupler; represented by H. J. Seibel, Jr.

Safford Automatic Coupler Company, Boston, Mass., car coupler; represented by W. A. Parsons.

Spirittine Chemical Company, Wilmington, N. C., samples of spiritine, oil and wood fillers, samples of work; represented by A. Smith.

Self Winding Clock Company, New York, self winding synchronized clock; represented by H. Montague Fitt.

Spaulding, H. E., Saratoga, N. Y., self-loading truck.

Sturtevant, B., F. Company, Boston, Mass., illustrations of shop heating and ventilating; represented by A. T. Barnes.

Schenectady Locomotive Works, Schenectady, N. Y., compound locomotives on D. & H. R. railroad tracks; represented by A. J. Pitkin.

Standard Steel Works, Philadelphia, Pa., samples of wrought car wheels in process of manufacture.

Such, B. J., New York, car blind and screen.

The Trojan Car Coupling Company, of Troy, N. Y., showed a number of M. C. B. couplers; represented by A. H. Renshaw, H. H. Burden, T. F. De Garmo.

The Thurmond Car Coupling Company, of New York, showed the Thurmond M. C. B. passenger, freight and tender coupling, also its carrier iron for eliminating all difference in coupling on curves with the long Miller shank.

Among the exhibits the showing made by the National Car Door Company, of Decatur, Ill., was noticeable.

A number of these doors are now in successful use on the Wabash Railroad. Among the claims are: No crow-bar necessary to raise the Decatur door. It is raised by a lever and locked by finger attachment on the same which prevents the door from bulging. It is protected all around by iron plates and cannot be nailed.

B. E. Tilden & Co., of Chicago, was represented by Mr. Tilden. He exhibited car and locomotive replacing frogs. The Tilden improved bridge guards were also on exhibition.

Turner Storage Receptacle Company, Chicago, Ill., card receptacle.

The Universal Brakebeam Company, of Chicago, was advocated by LeGrand Cannon, the General Manager of the company.

United States Metallic Packing Company, Philadelphia, Pa., piston rod packing.

The Vose & Cliff Company, of New York, had a specimen of King's yielding side bearing.

The Van Dorston Cushioned Carrier Iron and Railway Supply Company, of Washington, D. C., had carrier irons and the Columbia M. C. B. car coupler.

Vacuum Oil Company, Rochester, N. Y., vacuum cooling compound; represented by C. S. Marden and H. W. Brigham.

Vulcan Car Coupler Company, Cleveland, O., car coupler; represented by F. W. Parsons.

Vitrified Wheel Company, Westfield, Mass., samples of corundum wheels and rubstones; represented by A. L. Brush.

Dyer Williams, of Cedar Rapids, Ia., exhibited models of his two couplers.

Weeks, Bush & Company, Rondout, N. Y., car coupler.

John A. White Company, Dover, N. H., dust guard; represented by C. H. Arnold.

H. A. Wheeler, Chicago, Ill., Edwards' car window; represented by O. G. Edwards, E. N. Gilfillan.

Williams' Automatic Car Coupler Company, Chicago, Ill., car coupler; represented by Dyer Williams.

Williams, W. D., Salt Lake City, Utah, Cambria automatic coupler.

Watson Car Coupler Company, Paterson, N. J., car coupler; represented by W. L. Watson, C. J. Ackerman.

Yerdon, William, Fort Plain, N. Y., hose band.

A Pleasant Route.

To one making a journey in Colorado, New Mexico or Utah, or taking a trans-continental tour, the Denver & Rio Grande gives accommodations equal in convenience and luxury to those of other lines, with the added attraction of the grand and unparalleled scenery along the line. The completion of the standard gauge of the road, which a few years ago was considered impossible, is certainly a triumph of daring engineering skill. The new line by way of Leadville threads the cañons of the Eagle and Grand rivers, and gives a view of some of the grandest scenery in the world, presenting to the traveler a constant succession of surprises at the beautiful effects of snow covered mountains, and cañons and rivers adorned with evergreen verdure.

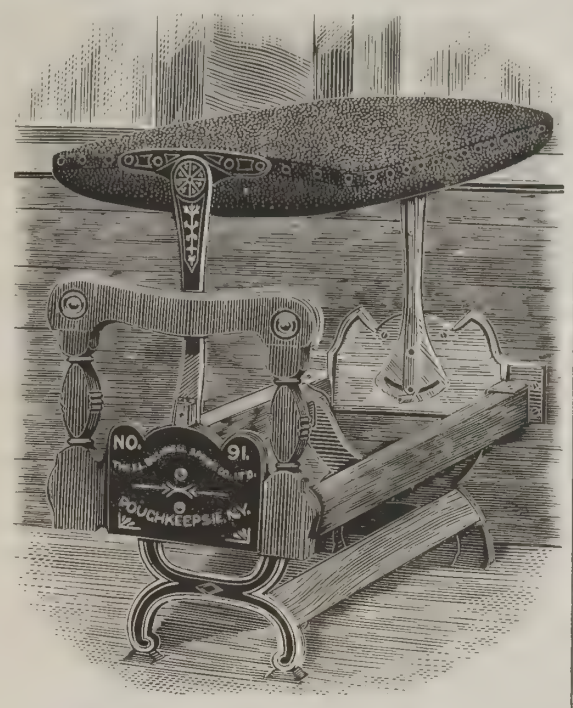
The overland train is a model of convenience and comfort in every respect, and the rolling stock, roadbed and bridges of this great "scenic route" are maintained in the highest degree of perfection, so as to insure absolute safety as well as comfort to its patrons.

The manufacture of wire is one of considerable antiquity, and has been traced as far back as the period of early Egypt. A specimen of wire made by the Ninevites 800 years B. C., is exhibited in the South Kensington Museum Homer and Pliny referred to similar productions in their writings. From such remote eras up to the fourteenth century wire in its general acceptance was produced by hammering out strips of metal. The operation of wire-drawing is mentioned as early as the fourteenth century, for in the chronicles of Augsburg and Nurnburg, of 1351 and 1360 respectively, are references to wire-drawers, so that it is reasonable to infer that the draw-plate was known and used at that period.

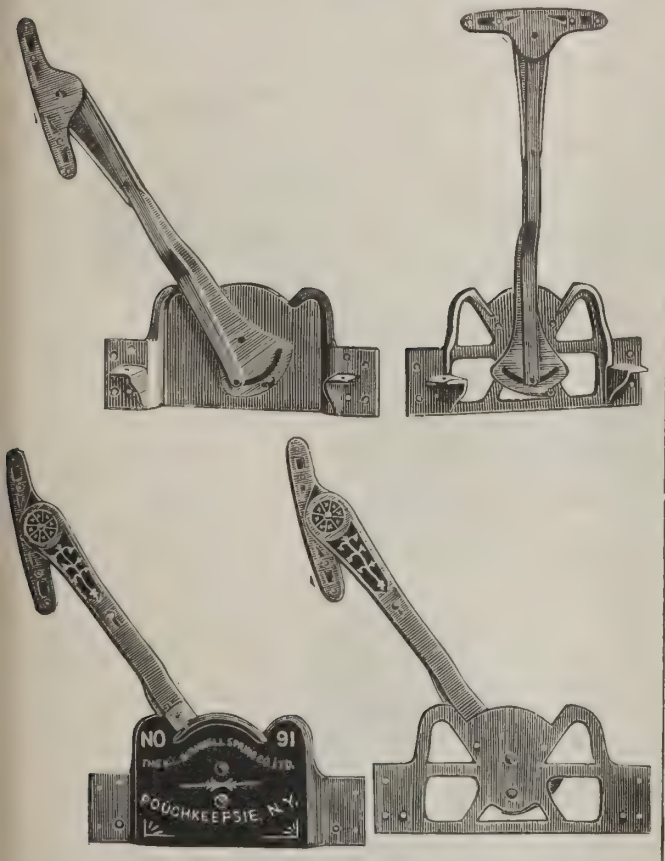
The handsome passenger depot of the Pennsylvania Railroad Company at Jersey City, opened in April, is far ahead of any other in this country in point of architectural beauty and capacity, and is the last bold stroke of the Pennsylvania company in connection with the elevation of the tracks through Jersey City. The main building is 188 feet long. At the north is a lobby 40 feet long and at the south another of the same proportions. The waiting room is 84 feet long and 83 feet wide. The men's smoking room and ladies room are at the north end, as well as a barber shop and spacious ticket office. In the south end is a large restaurant, partitioned off by long, hand-carved spindles that give the interior a very beautiful appearance. The seating capacity of the waiting room is about three hundred. The roof of the building is arched, the curves sloping toward the east and west. The interior is finished in chestnut and is plain and substantial. No attempt has been made at display, and the building looks all the better for it. Probably the most artistic feature of the interior is the dull, wrought-iron fancy panelings in the south doors leading from the restaurant. In the centre of the waiting room is a long chandelier, containing 85 incandescent electric lights, each of 34 candle power. At intervals are smaller chandeliers with electric lights. The fixtures are also provided with gas.

The Bushnell Car Seat.

The accompanying cuts illustrate an improved car seat, which was on exhibition at the recent convention of Master Car Builders at Saratoga. The Bushnell Spring Company, of Poughkeepsie, N. Y., the manufacturer of this seat, is receiving a liberal share of patronage from prominent railroads, who have specified the No. 91 seat for both new equipment and old passenger cars. In this seat are combined comfort, simplicity and durability, as the construction of the arm levers (or fixtures) are such that there is positively no lost



motion when reversing the seat back, and when locked in position it is as rigid and firm at side of car as at the aisle end. The fixtures are complete in themselves, doing away with guards and stops at side of car, and by the use of screws form all joints, thereby saving a large amount of cabinet work required on other seats. The lock is also part of the fixture and is perfect in its working. The seat back is reversed in least possible space, as shown, and the cushion is tilted and carried automatically. A special feature of



merit is the overcoming all danger of broken arm levers by careless trainmen who reverse the seat backs, as it is impossible to throw or slam the back, which is carried steadily and smoothly without racking or jarring the seat. This company has just issued a new and complete catalogue of its car seats, seat springs, etc., which will be cheerfully furnished on application.

The United States Blow Pipe Company, of 16 South Canal street, Chicago, are equipping many wood-working factories and car shops with their system of piping and exhaust fans for the removal of dust, shavings, offal, etc., and conducting the same to the furnace through improved fire-proof, steel plate piping, feeding the shavings direct to the boiler furnace or depositing them in a vault constructed for receiving them. The system employed by this company has given very good satisfaction, the piping being perfect and the draught positive. Their latest improved patent "Vortex" shavings and dust collector, which they manufacture and guarantee, is conceded by those acquainted with it to be one of the best in the market and giving universal satisfaction. They challenge any one to find one in use that is not giving the most perfect satisfaction and that parties are not well pleased with. The company furnishes collectors, piping and furnace feed attachments complete. The Chicago, Milwaukee & St. Paul and the Chicago, Burlington & Quincy railroads and the Milburn Wagon Company, of Toledo, and other large manufacturing establishments are using this company's system.

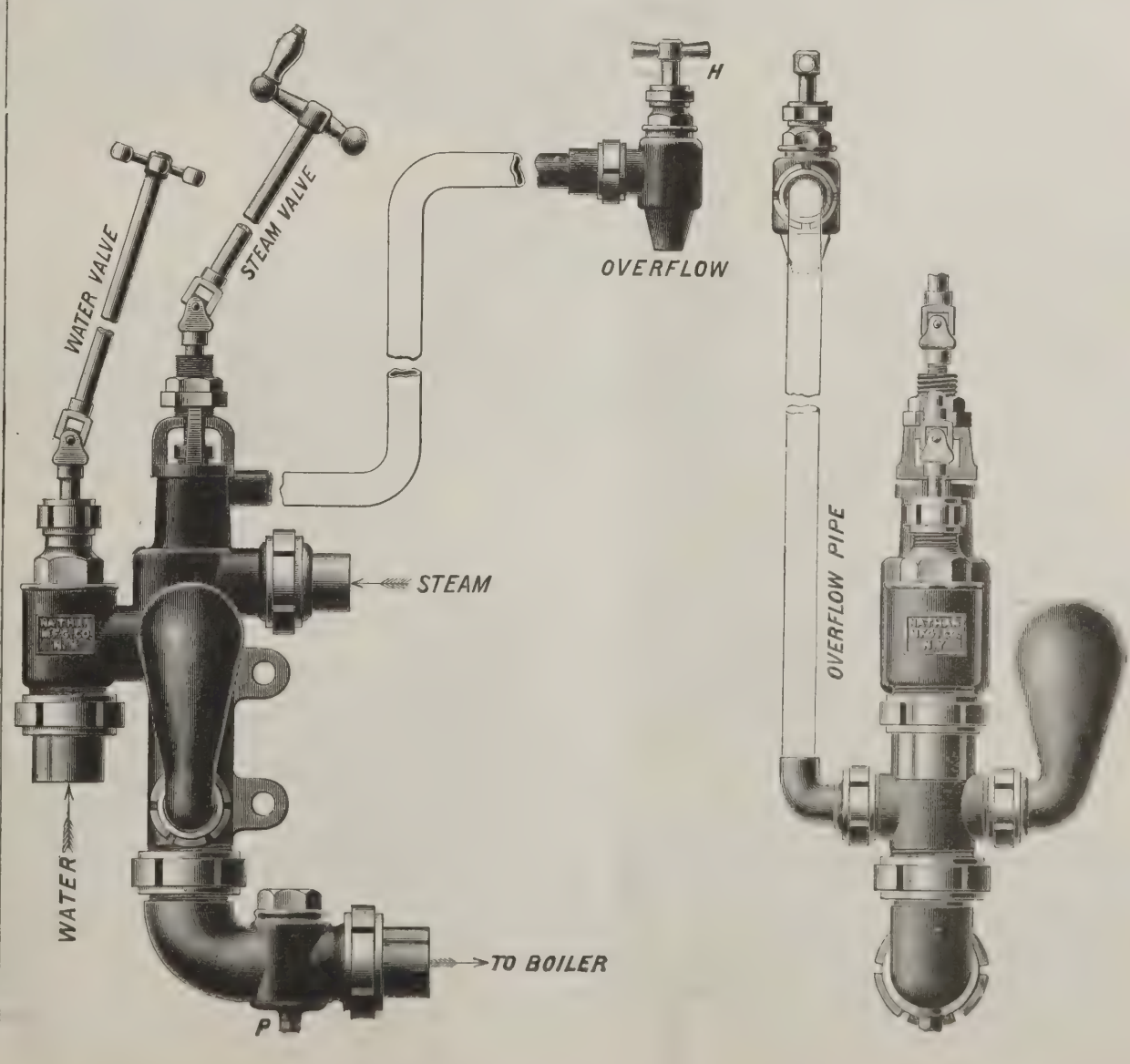
Considerable interest was manifested by those in attendance at the Master Mechanics' Convention in the springs with V-shaped bands displayed by the A. French Spring Co. Springs with this shape of band have now been in use for four years on locomotives doing service of the most trying character, and no case of breakage has happened. Five thousand of these springs are in use on several railroads, and are giving the highest satisfaction. This form of band produces an equalization of pressure of all the plates, and relieves the tendency existing with the rectangular band to have the short plates forced against the band, causing breakage. The reduction of band on the short plates imparts increased motion to springs having the V-shaped band, saves the spring from breakage and produces a much easier riding engine, reducing the destructive effects due to rough riding, and making a more durable spring, all without increase of cost.

This valuable improvement in springs is the invention of the veteran spring maker, Mr. George W. Morris, General Manager of the A. French Spring Co., Limited, and is the result of protracted experiment and long study to produce an easy riding spring.

The New "Nathan" Injector.

This new injector illustrated herewith combines in its construction the best qualities of both lifting and non-lifting injectors. This injector must be placed below the lowest level of the water in the tank, so that the water will flow to it, but unlike other injectors so placed it is provided with a priming jet, and what is the most novel feature in it the overflow is placed above the highest water level in the tank, and convenient to the engineer in the same manner as in a lifting injector, connecting with the overflow space in the injector body by means of a single piping, which can be applied and located in any convenient, unrestricted manner.

Among the special advantages claimed for the injector is that it will start readily at all times and under all circumstances; hot suction, leaky and defective boiler checks which cannot always be avoided, will not affect its prompt starting. It will not lose its capacity, as do some of the injectors when placed at a higher lift or when used at a higher steam pressure than designed for. It will not lose any more water in starting than any lifting injector, for the overflow is in sight of the engineer. When once regulated to the requirements of the service it is a perfect one-motion machine, a simple turning on of the steam valve always starting it. It is also claimed that the nozzle of this injector will not corrode, as the body is comparatively cool, being always filled with water. Then again, the steam from a leaky steam valve will not show at the overflow, and the cab will not be constantly clouded, and the view of the track thereby obstructed. The injector can be graded 50 per cent., so that it is suitable for heavy as well as light trains.



The Southern Pacific Company has lately put in service between San Francisco and Chicago 10 trains which are very handsome and are equipped with all modern improvements, among which are the Scarritt high back coach seats.

The Consolidated Car Heating Company desires to call attention to certain items of progress in steam heating of cars enumerated below and exhibited at the M. C. B. and M. M. conventions at Saratoga.

1. A new hot water circulating low pressure system known as the multiple circuit drum system. Its application does not break the seal of any water heater. It can also be used without any water heater. Works with four pounds steam pressure.

2. The improved commingler system, noiselessly injecting steam and leaving water heater always ready for building fire therein. Works with two pounds steam pressure.

3. Dust guard for Sewall steam coupler. The coupler is always to hang in this guard when not in use. It takes the place of the chain and protects the face of the coupler from injury.

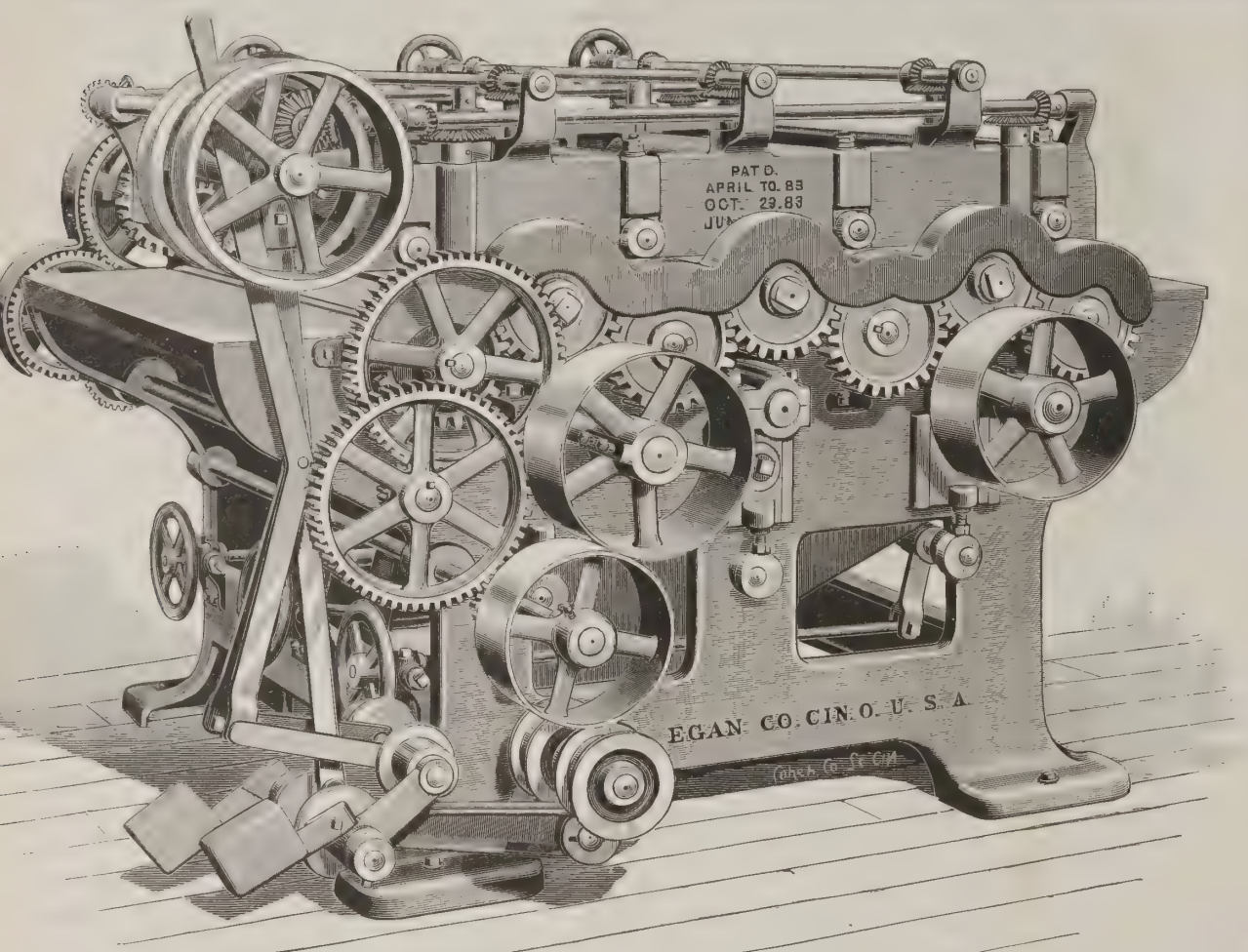
4. Special hose nipple for Sewall steam coupler. This special nipple is so designed that it absolutely fixes the position of hose when forced on such nipple, and insures standard length when couplers are repaired by putting on new hose. This is of special value when putting on new hose. These and other interesting apparatus will be fully described in the new catalogue of the Consolidated Car-Heating Company, which will be issued in August.

On June 11, Mr. John Gilson, paymaster of the Jordon Manufacturing Company, of San Francisco, drew $17,000 to pay employés working near Oakland. When the Southern Pacific train on which he was riding stopped at B station, between Berkeley and Oakland, two men boarded the train, and hastening to Mr. Gilson's seat forced him at the point of revolvers to give up the sacks of coin and then made their escape.

Triple Drum Sand Papering Machine.

We present herewith an illustration of the latest production in this line of machinery, the new 36, 42 and 48-inch triple drum sander manufactured by the Egan Co., Cincinnati, O.:

The frame is of neat design, made heavy in proportion to the width of the machine. All of the necessary parts are planed perfectly true and when bolted together make a very solid and rigid frame, capable of standing up to the very hardest kind of work that the machine may be put to, and absorbs any vibrations which may arise in the machine from time to time.



The feed is very powerful, consisting of eight feed rolls of large diameter, all heavily geared and made of solid steel, and so placed in the machine as to allow very short stock to be sanded. The upper feed rolls are driven by an improved system of expansion gearing, feeding through the machine stock of any thickness from ⅛ inch to 6 inches. The upper feed rolls and frame are made to raise and lower by power, and driven from the countershaft contained in the machine, so that it does not require a separate device to obtain this movement; and it is certainly a very desirable one, taking into consideration that every time a change of paper is made the upper feed rolls and frame must be raised and lowered to put the paper on the middle drum.

The three upper pressure rolls, one for each drum, are made to raise and lower parallel, independent of each other and operated by shafts, gears and hand-wheels and can be adjusted to suit the different kinds of stock to be finished.

The drums are made of solid metal, having a single fastening device for holding the paper and also for tightening same at any time the operator finds it necessary to do so. Each drum is thoroughly balanced and made with large steel shafts with extra long bearings lined with babbitt. Each drum is made to raise and lower independent of the other and from the working end of the machine, and this is accomplished without stopping the machine. This is a very desirable feature and not found on some of the machines of this kind. The last drum is fitted up with a patent brush attachment which is indispensable for fine work. It brushes the dust from the board before it goes through the feeding out rolls. Each drum is made to oscillate at a high rate of speed.

These machines will be found very desirable for many kinds of car work.

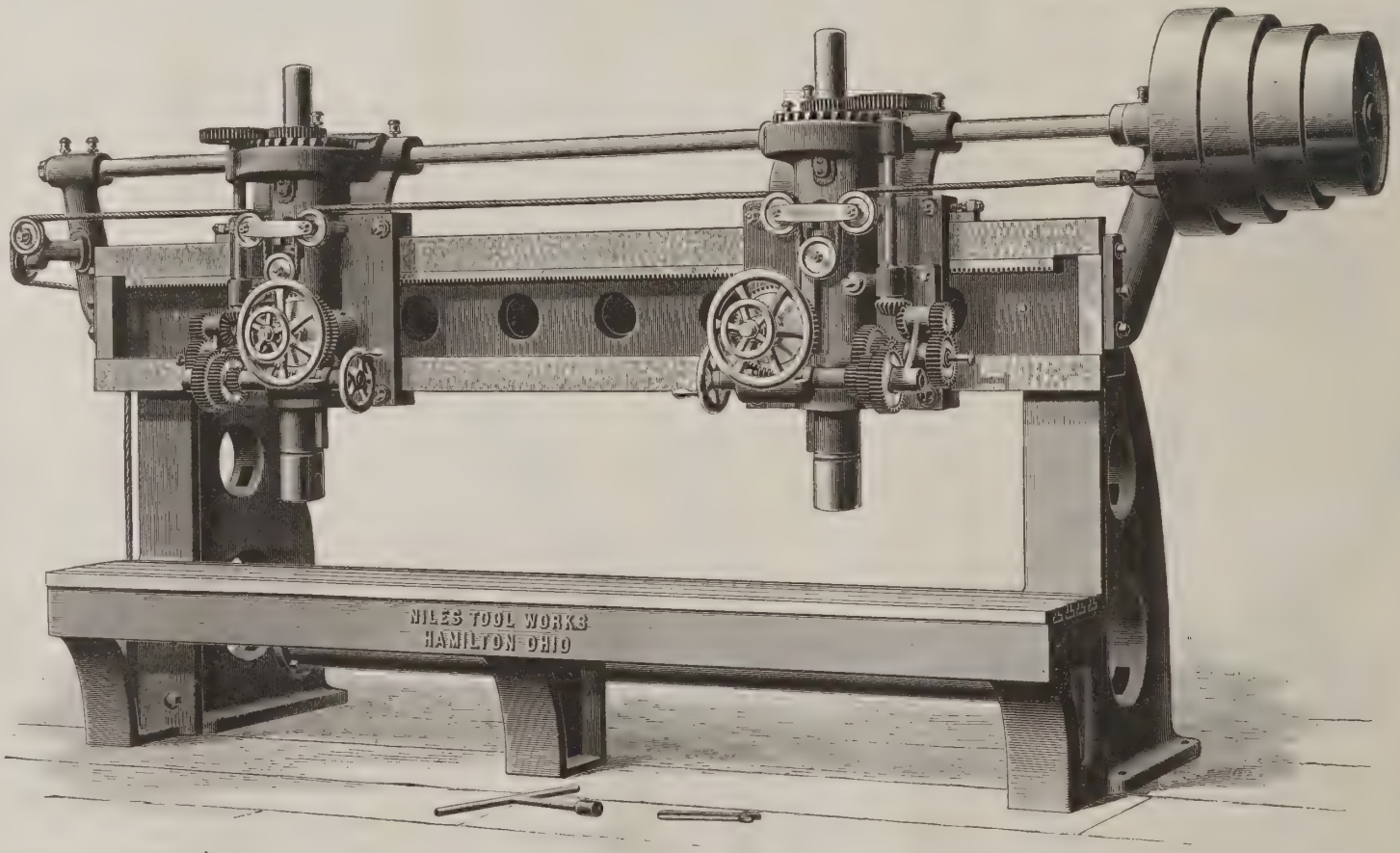
Rod Boring Machine.

The accompanying cut illustrates a machine especially designed for boring parallel rods for locomotives. It is built by the Niles Tool Works, Hamilton, O. It has great power and will bore both ends of the rod at the same time, thus allowing the work to be done in duplication with the greatest degree of uniformity.

The housings are double webbed, with the cross-rail and work table rigidly secured to them. The cross-rail has a width on the face of 20 inches, and the boring-head saddles have bearings on it 26 inches long. Saddles are quickly adjusted to position on rail by means of rack and pinion, operated by a T-wrench. Their relative positions once being determined for the work to be done, the saddles are firmly clamped in place.

Boring spindles are 3⅝ inches in diameter, having a vertical traverse of 14 inches and a range between centers of from 3 to 10 feet. Both spindles are counterbalanced by a single weight, in the same manner as the tool bars on boring and turning mills. This device permits an adjustment of the saddles without moving the weight, and does not burden the saddle or rail with additional weight to secure the counterbalance, as must be the case with other methods.

Three changes of feed are available for each spindle without the change of gears, ranging from $\frac{1}{32}$-inch to $\frac{3}{16}$-inch per revolution of spindle. Spindles have rapid hand motion to facilitate setting, and are provided also with slow hand feed. The spindles are always driven together, but the feed is independent for each.



The machine is designed for boring diameters ranging from 3 inches to 7 inches. Cone has four steps for 5-inch bolt, and transmits motion to the spindles through tangent gearing, securing great power with extreme steadiness and rendering the machine practically noiseless in action. Countershafting pulleys are 28 inches in diameter for belt 5 inches wide, and should run 100 revolutions per minute. When operating on a diameter of 7 inches, this gives a cutting speed of 20 feet per minute. All parts of the machine have been made unusually strong and accurately fitted, with ample provisions for taking up wear. The use of this tool will reduce to the minimum the time of boring parallel rods and any other similar work, and the finished product will be accurate and uniform.

The Manhattan Elevated Railroad in New York City is contemplating the use of electricity for motive power.

A Test of the Butler Drawbar Attachment.

On the afternoon of the first day of the Master Mechanics' Convention at Saratoga Mr. McGuire subjected the Butler drawbar rigging to a severe test. In connection with the standard coupler it was attached to a pair of seasoned white oak draft timbers each 5½ by 8 inches. The drawbar attachment used was that known as the Butler No. 278, and was mortised into the timbers, besides being fastened with seven eighths inch bolts. A double coil 6 by 8 inch spring made by the A. French Spring Company was used in the yoke style of connection. The first drop was that of the 1,640-pound weight in the shears of the Standard Coupler Company from a distance of 5 feet. This had no effect whatever.

The second drop was from a height of 10 feet, and this blow bulged out the back end, and the apparatus was so disabled that further work became impossible. The test was a very severe one.

The following is a summary of a test of the same attachment made by Frank MacMahon, engineer of tests of W. G. Ferris & Co., of Pittsburgh, before Mr. John McKenzie and others. Half set Butler drawbar attachment No. 9, with 6 by 8 draft spring inclosed; cases bolted together, setting upright on two steel columns; pressure applied on one sleeve to compress spring, of 42,000 pounds; pressure continued, to show resistance against thrusts from couplers or buffing, to 200,400 pounds, when ends compressed three-sixteenths inch; pressure continued until 257,700 pounds was reached, when end walls of the drawbar attachment bulged three-sixteenths inch; no condemning fracture shown.

We have received a small, nickel-plated sample of hollow staybolt iron from the Falls Hollow Staybolt Company, of Cuyahoga Falls, O. This company has recently received orders for its hollow staybolt iron from the Manhattan Elevated, and the Delaware & Hudson Canal and several other roads. A recent test of this staybolt iron at Washington University, St. Louis, showed among others the following results: Breaking strength per square inch, 49,200 pounds; limit of elasticity per square inch, 28,300 pounds; elongation of reduced reduced section (in 5 inches), 1.7 inches; per cent. of elongation, 34.0; per cent. of reduction, 50.

Prof. J. B. Johnson, Director of the testing laboratory where this test was made, said of the sample tested:

"This is a remarkably fine specimen of wrought iron for staybolt purposes. Its elongation, 34 per cent., is the greatest I have ever found for wrought iron, and this is of the utmost importance in staybolt iron. The fracture shows a pure, fibrous, unlaminated and uncrystalline structure."

A passenger train on the Grand Trunk Railway was derailed June 20 at a washout near Hillhurst, Que. Four men were killed and four others injured.

The Scarritt Car Seat Company, of St. Louis, now have contracts for equipping 120 coaches for the Chicago & Northwestern Railroad, for which they equipped 100 coaches during the past year, which will give them 220 coaches with Scarritt seats.

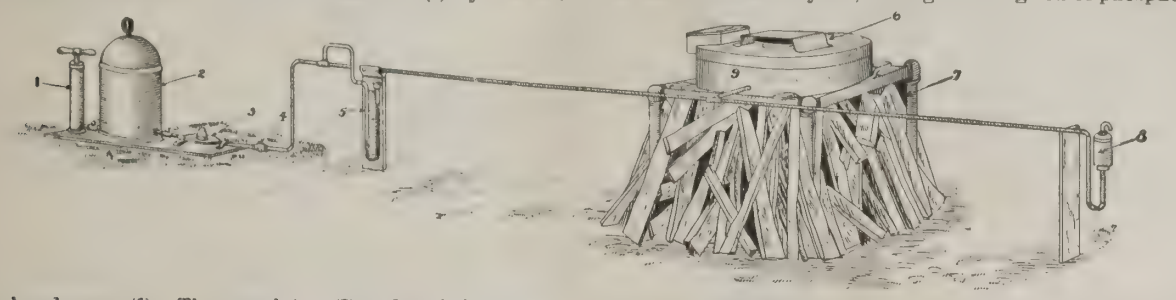
The magnificent gold tea service presented by the Czar and Czarina of Russia to Captain John Findlay, master of the Atlantic Transport liner "Missouri," the bearer of relief supplies to Russia, has been in turn given to the Atlantic Transport Line Corporation, the captain holding that the service was given him as the representative of the company.

Among the many handsome souvenirs presented to those in attendance at the June convention at Saratoga those presented by the Safety Car Heating and Lighting Co., of New York, will probably be most highly prized and long remembered by the recipients. These were solid sterling silver spoons with the word PINTSCH appearing in the bowl, and a representation of the well known Pintsch gas lamp and the legend "June, 1892," appearing on the handle.

Fire Test of Carburetor.

The arrangement of the details of a fire test of a carburetor of the Frost system of car lighting is shown in the illustration presented herewith. The test was made at Pullman, Ill., May 13, to demonstrate whether or not any serious consequences would follow if one of the carburetors used with this system was subjected to an intense heat. Our illustration shows that the arrangement of details were such as to be essentially the same as on a car in actual service.

The air was supplied in the air reservoir (2) by means of



the hand-pump (1). The regulator (3) reduced the pressure of the air passing through it to two pounds per square inch and the check valve (4) served to retain the pressure of two pounds in the carburetor. The pressure gauge (5) consisted of a mercury column and registered the pressure in the carburetor. The pipe which conveyed the air to the carburetor was 40 feet long and represented the pipe placed on the roof of a car equipped for service. The carburetor (6) was of the "round" type 27 inches in diameter, and 6 inches deep over all, and was supported by the gas pipe stand (7) at a height of about 2½ feet from the ground. The supply of air entered the carburetor from the main pipe, by means of the tee (9) to which was also connected a pipe 10 feet in length leading to a safety valve (8). This safety valve is designed to relieve the carburetor of any excess pressure, and opens at a pressure of five pounds. It should be noted, in this connection, that the safety valve is so designed and located that, should the car turn over, the mercury, which is the essential feature of the valve, would run out and thus allow the accumulated gas to escape, thereby extinguishing the lights at once.

The carburetor which was subjected to the fire test was charged with five gallons of 88 degrees gasoline, whereas the usual maximum service charging of a round carburetor is 2½ gallons. Air was admitted to the carburetor until the service pressure of two pounds was registered on the mercurial gauge (5), and then the fire, which was made up of four barrels of pine wood was lighted. The time of starting the fire was 1:40 and the rise of pressure due to the heat of the carburetor was as follows:

Time, P. M.	Pressure.
1:40	2 lbs.
1:42½	3½ lbs.
1:43½	4 lbs.
1:44	4½ lbs.
1:44¼	5 lbs.

At 1:44¼, when the pressure of five pounds was reached, the safety valve (8) opened and the pressure dropped almost immediately to two pounds and then the surface of the mercury in the gauge rose and fell rapidly several times, registering pressures varying between two and four pounds. At 1:46 the solder melted from the joint of the air connection at (9) and the gas escaped and burned at that point. Also the solder was melted and dropped from the seams of the mantle. At 1:49 several seams of the carburetor had opened and the cock box had become nearly detached from the mantle. It was not until 1:56, 16 minutes after the lighting of the fire, that the air stored in the reservoir (2) began to pass out through the regulator, indicating that by reason of the numerous openings the vapor generated by the heat was insufficient to retain the pressure in the carburetor at two pounds.

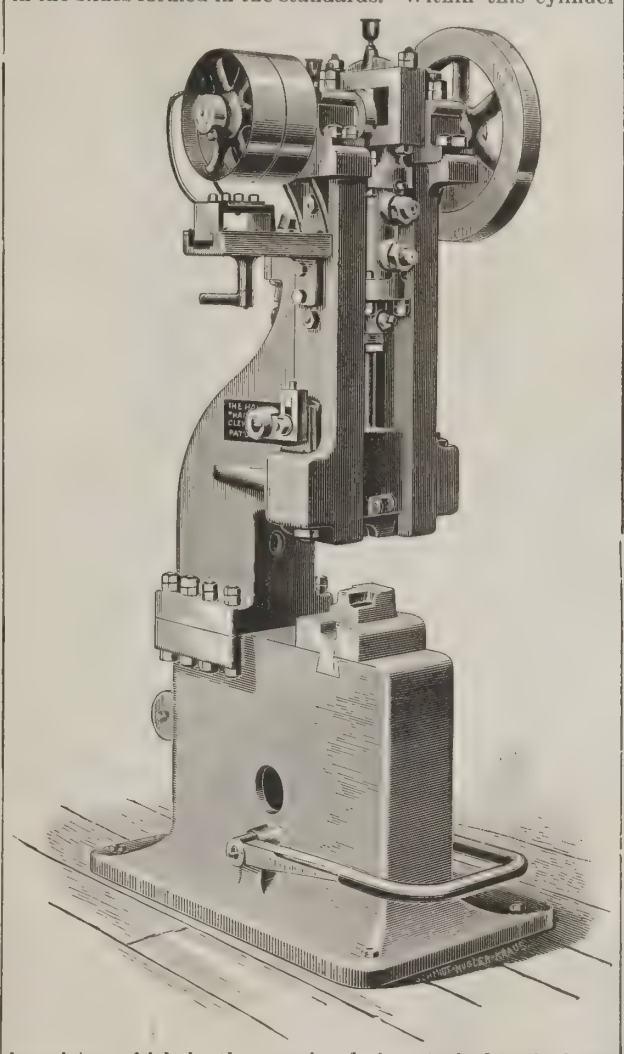
At the end of one-half hour the issue of gas from the carburetor had, to a great extent, ceased, showing that the greater part of the gasoline had been vaporized. The fire, however, was allowed to burn for an hour longer and then was extinguished and the carburetor cooled off. The only evidence of the presence of gasoline in or around the carburetor was the issuing of gas from the ruptured seams as above described, and at no time was there any explosion whatever, yet the conditions were much more trying in every way than could occur to a carburetor on a wrecked car.

The ability of the carburetor was plainly indicated by its condition after the test. The copper casing was taken off and the outer circular wall of kalamein iron removed to bring to view the wicking in the spiral passage. The wicking near the gas outlet was nearest to the side of the copper casing and was charred until it was almost black, although there was between it and the copper a wall of kalamein iron and a gas space of ⅜ inch. The wicking at the right was farther away from the copper but was charred to a dark brown. It is important to note that when the carburetor proper was removed from its casings the cotton wicking was dry and entirely free from the odor of gasoline. In view of the extreme conditions imposed and the results obtained as above described, it appears to be clearly demonstrated that there is no danger of the carburetors used in the Frost system of car lighting ever exploding under any conditions met in service.

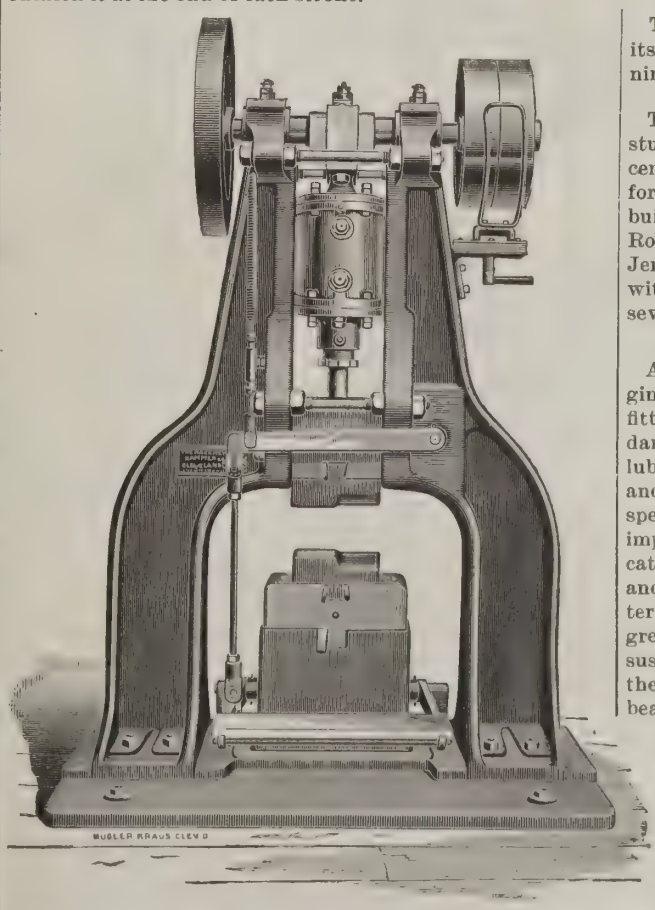
When Congress enacted the law that eight hours should constitute a day's work for all persons in Government employ it unknowingly adopted a principle laid down by the fathers of New Haven as set forth in the colonial records. From these it appears that "at a court of elections" held August 29, 1640, it was ordered "that nott above 4 months shall be accounted for winter in workmen's wages, provided thatt they improve eight howers diligently in worke every day when they expect to be payd for a dayes worke."

The Hackney Power Hammer.

The following cuts illustrate two styles of a new power hammer manufactured by the Hackney Hammer Company, of Cleveland, O. The hammers shown are the single and double standard hammers, the latter style being adopted for the larger sizes only, and the mechanism and method of working being practically the same in each. At the top of the standards there is a forged steel crank shaft working in bearings of phosphor-bronze, one on each side of the crank. The crank works in a yoke, having a sliding box of phosphor-bronze, this yoke being attached directly to the air cylinder below, which is thus given a vertical reciprocating motion in the slides formed in the standards. Within this cylinder



is a piston which, by the usual rod, is attached to the hammer head, the air, more or less of which is confined above and below the piston, serving to transmit motion to it and to cushion it at the end of each stroke.



The admission and confinement of air in the cylinder is controlled by valves, which may be worked by hand or foot, as is most convenient. In the larger sizes of hammers there are four valves, which admit air to supply the place of what may be lost in case there is any leakage. This, of course, they accomplish automatically and at each stroke, so that any reasonable amount of leakage does not interfere with the working of the hammer, and the piston and stuffing-box need not be so tight as to interfere with free working. The valves at the back of the cylinder are the ones by which the motion of the hammer is controlled, these valves being opened and closed by means of a sliding wedge. These valves open in reverse directions, so that when one of them is opened by the wedge the other is closed.

The action of the valves is so prompt and certain that a single blow can be delivered with the maximum force, and the hammer will be arrested and held at the upper end of the stroke by a brake provided for that purpose, which is controlled by the same lever that operates themselves. This enables the hammer to be used for drop forging simply by putting in suitable dies for that purpose, and without any other special preparation whatever.

The guides for the cylinder and hammer head are adjustable for wear, and can easily be replaced. In the smaller sizes the lower part of the hammer, upon which the die block rests, is made separately, so that it may be easily renewed in case of breakage, while all the larger sizes have separate anvil blocks, which are arranged to rest upon their own foundation, as shown.

The method adopted in the manufacture of these hammers is such as to secure workmanship of the best character, with all the advantages of interchangeable parts, which can be supplied at short notice. They are regularly built in six sizes, ranging from 50 to 500 pounds, the nominal size of the hammer being the weight of the head, rod and piston. The 50-pound hammer weighs 2,500 pounds; stands 6 feet 2 inches high over all; has 7 inches travel of head; uses dies 5⅛ inches long; is driven by a 3½-inch belt running on a 10-inch pulley, and will deliver 350 to 380 blows per minute. The 500-pound hammer weighs 14,000 pounds; stands 8 feet 5 inches high over all; has 14 inches travel of head; uses dies 14 inches long; is driven by a belt 5 inches wide running on a pulley 24 inches diameter, and can strike 200 to 250 blows per minute.

Consolidated Car Heating Company.

The annual meeting of the Consolidated Car Heating Company was held in Albany, recently. The affairs of the company were found to be in a prosperous condition, with excellent outlook for future business. A semi-annual dividend of 1½ per cent. was declared, payable Aug. 15, transfer books to close Aug. 1. Vice-President William G. Rice reported sales had averaged over $1,000 for every working day of past year. This included product of Canadian factory at Conticook, P. Q. The Sewall steam coupler and improved (McElroy) commingler were reported as being used by many leading railroads of the country, having a mileage of 45,071 miles and 11,204 passenger cars. During the year 16,471 of these couplers have been sold. Officers were chosen as follows: President, Robert C. Pruyn, Albany; Vice-President and Treasurer, William G. Rice, Albany; Secretary, Charles J. Peabody, South Orange, N. J.; General Manager, Daniel D. Sewall, New York; Mechanical Superintendent, James F. McElroy, Albany; Assistant General Manager, James H. Sewall, Chicago.

So far, fifty-nine foreign nations have signified the intention of participating in the World's Fair.

The two largest coal and iron companies in the South—the Tennessee Coal and Iron Company and the Debardeleben Coal and Iron Company—have consolidated. The property includes 17 blast furnaces and several coal mines.

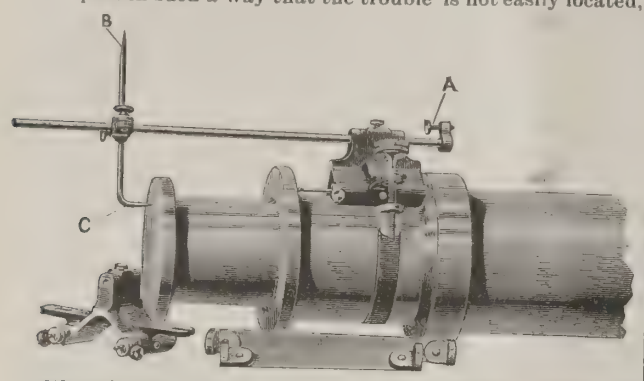
The Chicago, Milwaukee & St. Paul is receiving part of its new equipment, 16 coaches equipped with Scarritt seats, nine cars having lately been delivered.

The Jerome metallic packing, for piston and valve-stem stuffing boxes, has been applied to five Baldwin engines recently built for the Texas Pacific; 14 Baldwin engines built for the Columbus, Shawnee & Hocking; four Rogers' engines built for the New York, Susquehanna & Western, and 50 Rogers' engines for the C., B. & Q. Railway. Also, the Jerome packing for air pump stuffing boxes is being used with much success by the New York Central, C., B. & Q., and several other large roads.

A correspondent in the *American Machinist* says: If engineers, machinists and millwrights in general and pipefitters in particular knew of the good qualities of graphite, I dare say there would be ten times the demand for it. Its lubricating qualities are questioned only by the impractical, and it is this quality alone that sounds its key note, so to speak. Let me describe a few of what I consider its most important uses. As above stated its primary object is lubrication, and it is to this fact we must credit good pipe joints and cool bearings. In making pipe cement (or as I would term it, pipe smear), it is not necessary to use the best oil or grease, as it is the graphite and not the body in which it is suspended that makes the mixture valuable and the joint perfect. I use the drippings from line shaft bearings, caught in the ordinary way and mix it with the best Ticonderoga flake graphite so that it can be applied with an ordinary sash tool. During the past three years I have used about fifteen or twenty pounds of dry Ticonderoga flake graphite for pipe joints, cylinder heads, piston rod packing, etc. Bolts, smeared with graphite mixed as above, I have unscrewed after having been in the dampest places for upward of two years, or more, proving the antirusting qualities of graphite. To cool hot bearings put it on as thick as it will mix with oil. Almost any oil or grease will answer but don't use poor graphite.

Standard Crank-Pin Gauge.

Herewith we illustrate a very useful device for determining the defects that crank-pins, especially on locomotive driving wheels, are heir to. The ever varying strains to which such pins are subjected frequently result in bending the pins in such a way that the trouble is not easily located,

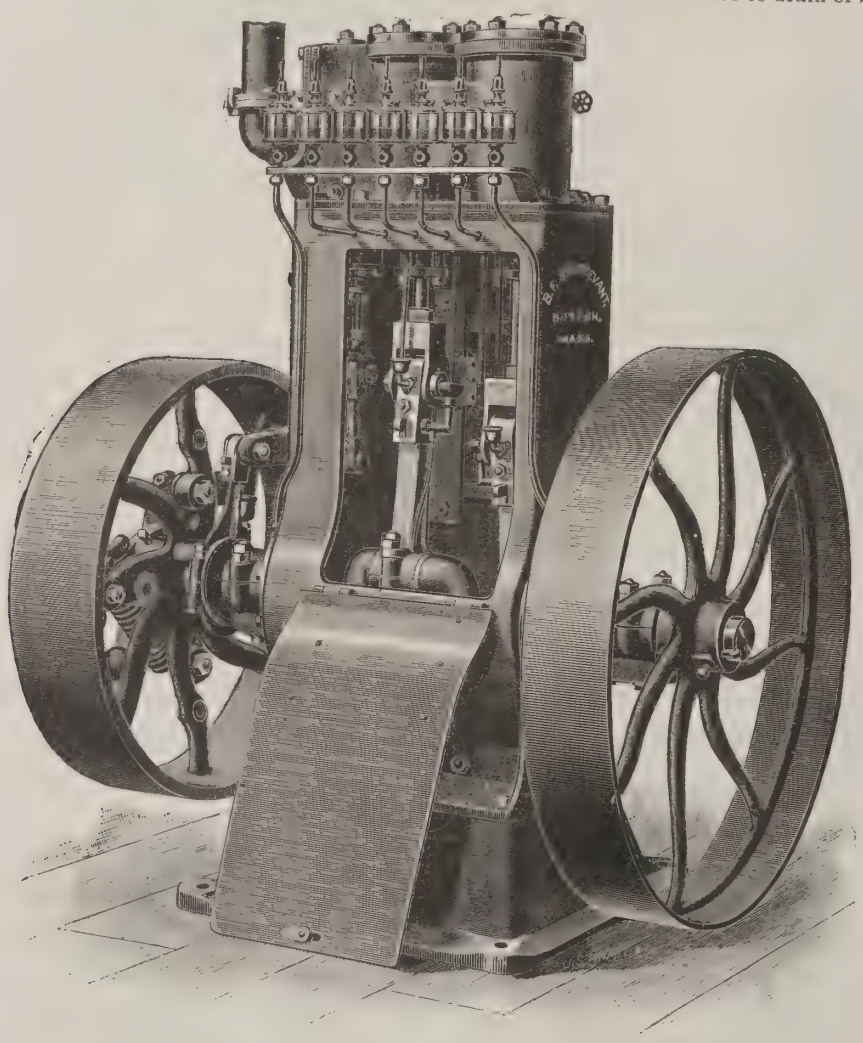


although made very apparent by the difficulty experienced in keeping rods in proper condition, and in preventing heating. Such defects as arise from this cause, together with those caused by uneven wear, are easily and positively located by the gauge shown above, and much annoyance and frequently unnecessary expense saved in enabling the proper treatment to be determined on at once. The gauge is manufactured by M. C. Hammett, Troy, N. Y.

The Sturtevant Automatic Double Inclosed Engine.

We present in the accompanying cut an unique design in the way of upright engines suitable for general work, but specially designed for fan propulsion and electric light work and made by the B. F. Sturtevant & Co., Boston. The bed upon which the engine rests is well spread, very heavy, and is so designed as to give the the engine a substantial foundation. The body of the engine is built in two parts, the upper part consisting of the cylinders alone which may be readily removed for reoiling. It will be seen that this makes a very convenient arrangement in case of necessity of repairing either the cylinder or the valve seat.

The valve is of the piston type and supplies both cylinders by a special arrangement of ports. The design of the cross-head is readily seen, it being of the slipper guide type running upon a steel slide bar attached to the back of the frame. The connecting rod is very substantial, being of the marine

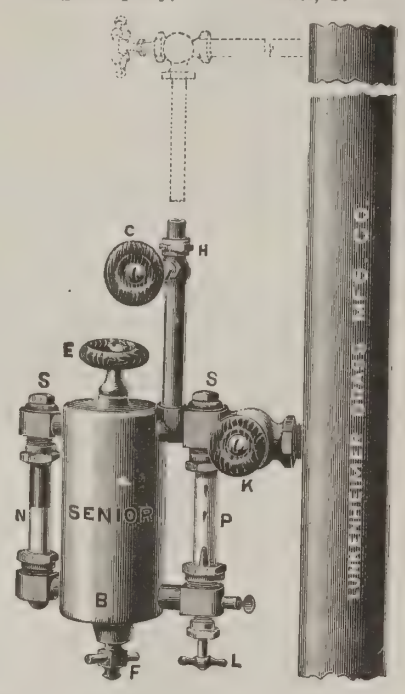


type with large crank pin bearings. The crank itself is carefully counterbalanced and all moving parts are made as light as is consistent with the heavy duty which is placed upon the engine. The regulation of the engine is secured by means of a shaft governor acting through a single eccentric to change cut-off from zero to ⅞ stroke. The oiling of the engine has had special attention, and the oilers are all collected together and connection to the various bearings made by means of tubes. By means of the doors shown the entire engine can be easily and tightly closed, preventing the admission of dust or the objectionable throwing of any oil upon the running parts. This is a very prominent feature of the engine, as it assures continuous running in dusty atmospheres where any other engine would rapidly become worn by the dust which would unavoidably enter all bearings.

As the cylinders are placed side by side in the same casting, the cranks set opposite at an angle of 180 degrees and steam admitted simultaneously at the top of one cylinder and the bottom of the other, the reciprocating parts are balanced in their movements and high speed is made possible. The cylinders are of large diameter, as compared with the stroke, so that a large amount of power may be developed at high rotative, but moderate piston speed. By the omission of the band wheel and the bed beneath the engine it may readily be placed upon a frame casting and connected direct to the shaft of a moderate speed dynamo; in fact, although it has been but recently introduced, it is being very generally employed for this particular purpose and its record as a contiuuous running, high-speed engine is warranting its introduction.

The "Senior" Sight Feed Lubricator.

The accompanying illustration shows a sight-feed lubricator recently placed upon the market by the Lukenheimer Brass Manufacturing Company, of Cincinnati, O.



Following is the description: *B*, oil reservoir; *C*, upper valve; *E*, filling plug; *F*, drain valve; *H*, union to connect condenser pipe and valve; *K*, discharge valve; *L*, valve for regulating flow of oil; *N*, indicator glass; *P*, sight feed glass with valve to drain or blow out the same.

The advantages of this lubricator consist of its simple and practical construction, No condensing bulb or chamber to freeze and burst. Plugs to facilitate replacing and cleansing of glasses. Vent to blow out sight-feed glass. Shanks on ⅛ and ¼ pint sizes threaded for ⅜-inch pipe instead of ⅛ inch, consequently easily attached to small steam pipes.

It is made in eight sizes from one half pint to one gallon, inclusive, either in glass or nickel-plated.

We have received from the Weir Frog Co., of Cincinnati, O., two miniature die formed steel rail braces, nickel plated. These miniature braces conform in material, mode of manufacture and general form to the regular die formed steel braces as used for track purposes. The full sized braces are made of homogeneous steel plate, one-quarter or five-sixteenths inch thick, as preferred, and so formed as to furnish parallel vertical sides. These vertical sides are bridged across under the head of the rail, to strengthen them at the point where it engages the under and outer sides of the head of the rail. This arrangement furnishes a more rigid and a stronger brace with the given thickness of material than any other brace yet designed, and it being of the box form it fits over the one spike in the tie, and then being secured with three spikes makes a very rigid support. There are nearly two millions of these braces now in use on the different roads throughout the country.

Editor National Car and Locomotive Builder:

Will you kindly give space to the following notice which will explain itself. Very respectfully,

THE NATIONAL CAR HEATING COMPANY,
N. R. BAKER, President, 436 Rookery, Chicago.
CHICAGO, Ill., May 21, 1892.

To Manufacturers and Users of Railway Car Heating Apparatus, and all others whom it may concern:

Please take notice that I am the sole owner of letters patent for an apparatus for heating railway cars granted to John Q. C. Searle, upon the 10th day of May, 1890, No. 474,417.

It is one object of the patented invention to provide a car heating apparatus having circulating pipes on both sides of the car, two cross-over pipes and two steam-heated passages or drums communicating with said circulating pipes, a train pipe for supplying steam to heat the circulating liquid, and an expansion drum communicating with the system.

Please take notice, also, that I have granted an exclusive license under said letters patent to the National Car Heating Company, of Topeka, Kan., of which corporation Mr. N. R. Baker is President, the offices of the company being at 436 Rookery Building, Chicago, Ill.

You are particularly cautioned, therefore, against manufacturing, buying, selling, using or procuring to be manufactured, bought, sold or used any heating apparatus containing the said invention or any material and substantial part thereof, except you shall buy the same from the said National Car Heating Company.

Any person, firm or corporation disregarding the exclusive rights under said patent will be made defendant in a suit for infringement without further notice or delay, and litigation will be pushed vigorously to any extent necessary in order to protect the rights vested in me, as assignee, by the grant of said letters patent.

Claim 1 is as follows:

In car-heating apparatus, the combination, with the liquid circulating pipes that are located on the opposite sides of the car, of cross-over pipes located intermediate said circulating pipes, steam heated liquid, circulating passages located on opposite sides of the car, communicating with said cross-over pipes and with said circulating pipes, and a train pipe for supplying steam to heat said liquid circulating passages.

Very respectfully,
JULIA E. SEARLE.

The Chicago & Alton has just put in service some of the most complete trains in the country, having every convenience. They are equipped with their standard seats, the Scarritt high back.

The Baldwin Locomotive Works have issued a pamphlet descriptive of the Vauclain system of compound locomotives, and containing some suggestions as to the best methods of operating same, and in regard to making comparative tests.

The plant of the Sampson Cordage Works, of Boston, has lately been increased for the manufacture of "Samson" braided cord by the purchase of a water power near the works which it is expected to transmit by electricity. The present power has been insufficient without the use of steam.

The Nathan Manufacturing Company, of 92 and 94 Liberty street, New York, has issued an illustrated catalogue descriptive of its articles of manufacture for locomotives. Among these are several new devices which have not been illustrated in previous catalogues of the company. These include the new "Nathan" injector, a steam fire extinguisher for attachment to yard engines, a combined steam boiler, washer and filler, and a steam sanding apparatus. The illustrations are all very good and the catalogue is bound in blue cloth with gilt letters.

Our Directory.

Baltimore & South Western.—J. G. Neuffer has been appointed Master Mechanic, vice E. Evans, resigned.

Brooklyn Elevated.—O. F. Nichols has been appointed General Manager, vice F. Martin, resigned.

Brooklyn & Brighton Beach.—W. Findlay has been appointed Superintendent, vice J. L. Morrow, deceased.

Buffalo, Rochester & Pittsburgh.—W. J. Reilly, Purchasing Agent, has resigned.

Central of Georgia.—T. C. McNeely has been appointed Superintendent of the Main Stem Division.

Central Ontario.—J. D. Riddell has been appointed Superintendent.

Central Vermont.—G. W. Kenney has been appointed Master Mechanic of the Rutland division. Headquarters at Rutland, Vt.

Chicago, Burlington & Quincy.—C. M. Levey has been appointed Superintendent Iowa Lines, vice C. G. Wilson, deceased.

Chicago & Northwestern.—O. Miller has resigned as Superintendent of the Galena Division. J. C. Stuart has been appointed Superintendent Galena Division.

Chicago, St. Paul & Kansas Oity.—D. McNab has been appointed Superintendent Chicago Division, vice J. D. Farrell, resigned.

Cleveland, Cincinnati, Chicago & St. Louis.—J. H. Berry has been appointed Master Mechanic of Cincinnati Division. F. M. Lawler has been appointed Master Mechanic Chicago, Indianapolis & White Water divisions, vice O. H. Jackson, resigned. G. S. McKee has been appoined Master Mechanic St. Louis Division, vice F. M. Lawler, transferred.

Cleveland, Lorain & Wheeling.—F. M. Townsend, Superintendent, has resigned.

Michigan Central.—O. F. Jordan has been appointed Superintendent of the Canada and Michigan divisions, vice J. B. Morford resigned.

Minneapolis & St. Louis.—S. M. Lohren has been appointed Purchasing Agent, vice W. B. Palmer, resigned.

New York Central & Hudson River.—J. H. Franklin has been appointed General Manager of the Harlem division, vice C. H. Platt, resigned.

New York, New Haven & Hartford.—C. H. Platt has been appointed General Superintendent.

North Pacific Coast.—W. Graves has been appointed General Manager, vice J. W. Coleman resigned.

Paducah, Tennessee & Alabama.—W. J. Hills has been appointed Superintendent, vice W. E. Dauchy, resigned.

Richmond & Danville.—V. E. McBee has been appointed General Superintendent of South Carolina lines, with office at Columbia, S. C.

Sioux City and Northern.—F. C. Hills, General Manager, has resigned, and the office has been abolished.

Silver Springs, Ocala & Gulf.—A. P. Man, Jr., General Manager, has tendered his resignation, and the same has been accepted.

South Carolina.—E. M. Roberts has been appointed Superintendent of Motive Power.

Toledo, Ann Arbor & North Michigan.—A. Ward has been appointed Division Superintendent with office at Frankfort, Mich.

Union Pacific System.—S. H. H. Clark has been elected President.

West Shore.—J. Howard has been appointed Master Mechanic, Hudson River Division, with headquarters at New Durham, N. J.

Employment.

WANTED—A position as Master Car Builder, or general foreman of car department on some railway by a man of fifteen years' practical experience and who is fully competent Ample reference furnished. Address A. J. W., care NATIONAL CAR AND LOCOMOTIVE BUILDER.

NATIONAL CAR AND LOCOMOTIVE BUILDER

AUGUST, 1892.

CONTENTS.

The summit of Pike's Peak has recently been connected with the city of Denver by telegraph wires.

The Grand Trunk Company has secured entrance to Ottawa over the line of the old St. Lawrence & Ottawa road.

The Government of Nicaragua has enacted a law making the metric system standard in that republic after Jan 1, 1893.

The total number of workmen at Jackson Park, Chicago, now exceeds 7,000. It will probably be increased to 10,000 or more.

The Chicago, Burlington & Quincy railroad gave notice July 22 that it would withdraw from the Western Traffic Association.

The National Car Door Company, of Decatur, Ill., has been chartered by R. E. Pratt, F. M. Pratt and S. W. Grosh. The capital stock is $50,000.

The Buffalo, Rochester & Pittsburgh, has placed an order for 500 cars with the Jackson & Woodin Manufacturing Company, of Berwick, Pa.

A Saginaw, Mich., man, Mr. D. R. Edwards, has invented a sawing machine in which the saw is stationary, and the log is forced over the saw.

A mortgage of $1,500,000, from the Burton Stock Car Company to the Atlantic Trust Company, of New York, was filed at Wichita, Kan., on July 9.

The Long Island Railroad has received several new engines from the Baldwin Company, of Philadelphia. They are compounded after the Vauclain system.

The Empire State express, on the New York Central, on July 4 traversed the distance between Syracuse and Buffalo, 128 miles, in 123 minutes including stops.

A loss of $20,000 has been sustained by the Rathbun Car Works, as Deseronto, Ont., by fire, destroying the south end of the erecting shops and some valuable machinery.

The first exhibit to be taken into the World's Fair consisted of thirteen enormous logs, containing 1,534 feet of lumber. They came from Canada, having been chopped from the great northern pines of that country.

The New York, Lake Erie & Western has added twenty-seven new passenger coaches to its equipment this season, in order to keep pace with the excursion business. More new cars are being built.

Contracts have been let by the South Side Rapid Transit Company, of Chicago, for the Southwestern extension to Jackson Park, and work has begun. The line may be completed by Dec. 1.

The result of the enumeration of Chicago's population, which has been going on for some time under the auspices of the School Census Committee, shows that Chicago has 1,428,318 people within her limits.

The Intramural Railroad, which is to be operated in Jackson Park, Chicago, during the World's Fair, is now receiving bids on the elevated structure and rolling stock. The road will have five miles of track.

The Empire State Express on the New York Central is now carrying five cars between New York and Utica instead of four. The extra car is run between New York and Clayton.

It is reported that freight conductors on the Atchison, Topeka & Santa Fe made in the month of May $240 each, and brakemen averaged for the some month $170. Engineers and firemen made $275 and $160 respectively.

The Buffalo Car Manufacturing Company is turning out ten new cars per day, and has orders for 1,000, all of which will take yellow pine sills and the gondolas yellow pine sides. The box cars will have white pine sides as usual.

Buffet smoking cars are now run on the limited trains of the Chicago & Northwestern between Chicago and Minneapolis. These cars are for the use of the sleeping car passengers, and are both handsome and complete in their appointments.

It is proposed, as the science of electricity has no name of its own, to call it "electrics." The two words, electrics and electrician, would thus be in analogy with optics and optician, mechanics, and mechanician, mathematics and mathematician, and others.

The steamship "Dubbledam," from Amsterdam, was released from Quarantine at New York recently after an unusually long detention. When asked what he thought was the cause of the vexatious delay, the "Dubbledam's" captain simply pointed to her name.

The present equipment of Pullman cars now operated on the Western New York & Pennsylvania road is soon to be removed and replaced by new cars, the company having made a 25 years' contract with Pullman for the operation of the latter's cars on all its lines.

More than one thousand men are now at work on the mammoth Manufactures Building for the World's Fair. The force was recently doubled by order of the Exposition authorities, who concluded that the contractor was not making as rapid progress as was desirable.

Arrangements have been completed for the erection of a Pintsch gas works of 400 cars capacity at Toledo. This plant will be able to supply gas to the Lake Shore & Michigan Southern road for all cars running between Toledo and Chicago, and Toledo and Buffalo.

A Northern Pacific conductor shot two men riding on the roof of the express car of his train July 19, near Valley City, N. D. One died instantly. The men pulled the bell rope to stop the train. When the conductor ordered them to come down they refused, with the above result.

The General Baggage Agent of the Baltimore & Ohio road states that in 1891 there were over 2,500,000 pieces of baggage handled on the Baltimore & Ohio system, and but two trunks were lost; and, further, that during the year the company did not pay out $100 for damages to baggage.

The Western roads are looking forward to a large grain carrying business this fall. The statement of a freight representative of one of these roads, who has made a tour of Kansas, is that the crop prospects are brighter than they have been in ten years, and even last year's phenomenally large crop promises to be outdone.

The Baltimore & Ohio Railroad will make an exhibit at the World's Fair showing the history and development of railways from their beginning to the present time. In pursuance of this purpose it has sent a representative to London to prepare models of the chief objects of the many in the Kensington Museum relating to railways.

The French Minister of Public Works has issued orders according to which beginning with June 1, last, only such persons may be appointed locomotive runners or firemen as are French by birth or naturalization, present certificates of normal sight and hearing, and are able to pass satisfactorily examinations as to their knowledge of the duties of the positions.

The vestibule trains of the Old Colony Railroad, running between Boston and Fall River in connection with the Fall River boats, are provided with a colored attendant, who passes through and serves passengers with ice water, thereby saving the passengers the trouble of walking through the length of a car, an uncomfortable performance while a train is in motion.

The desire of the Western roads to secure as many as possible of the Christian Endeavor representatives prompted them to offer an exceedingly low rate east from Chicago. The result is that summer tourist rates are practically wiped out, and the public will have the benefit of low rates, which, in consideration of the above concessions, are now available to everybody.

General Passenger Agent Daniels, of the New York Central, has issued in handy form a little book called "The Lake Region of Central New York." For persons not familiar with the wonders of this healthful region, long famous as a favorite spot for tourists and summer visitors, the book will be interesting. It is profusely illustrated, and the location of the lakes shown on a large colored map.

The St. Charles Car Company during the past eight months has been doing the largest business it has had for several years. The works at St. Charles are being enlarged so that their capacity for building freight cars will be increased eight cars per day, and to accommodate 12 more passenger cars in course of construction. A new engine has been put in and much new improved machinery.

St. John's, Newfoundland, was devastated by fire July 8 and 9. Fully two-thirds of the city was burned over, destroying 600 buildings, rendering 15,000 people homeless, killing seven people and destroying property estimated to have been worth $10,000,000. The fire burned in all directions as long as there was anything to burn, only being checked when the thinly settled outskirts were reached.

The figures for the wheat and flour exports of the cereal year are now in. The wheat export for the year was 13,100,470 centals, and the flour export was 1,083,772 barrels. These exports fall below those of last year, but their gross value amounts to $27,303,100, which is the largest figure for five years. The wheat and flour fleet for the year numbered 270 vessels. Of these 180 went to Great Britain and 61 to France.

California is to exhibit at the World's Fair one of the famed huge redwood trees, or *sequoia gegantea*. The one selected is 300 feet high and more than 30 feet in diameter at the base. A specially constructed train will be necessary to carry the monster across the continent. It is the intention to hollow the base into booths in which will be sold California wines, fruits and curiosities made of polished redwood.

A fatal collision occurred about four miles west of Tamworth, Ont., July 21, on the Bay of Quintery road. The regular passenger train was coming from Tweed on time when it was met by a special from Erinsville consisting of engine and tender, both going at full speed. They met in a deep cut and instantly engines and cars were piled in an indescribable mass. Three persons were killed outright and five seriously injured.

As was contemplated last year, when Lieutenant Peary set out on his Greenland exploring expedition, a relief party, taking further supplies for the explorers, or with the design of bringing them home if their work is completed, sailed from New York, June 27. If Lieutenant Peary and his party are not brought back, fresh supplies will be left for their maintenance in their northern exile another winter, should this be unavoidable.

The first California special fruit train for London, consisting of five cars, left Sacramento July 19 under charge of the California Fruit Transportation Company. It made the run to New York in 7 days and the fruit was transferred in half an hour to the steamer "Majestic," of the White Star Line. The vessel is fitted with refrigerator capacity for five car loads. A regular auction day will be established for California fruit in London, and trains of five cars each will be sent out regularly.

Anticipation of an early completion of the Trans-Andine Railway between Argentine and Chili is somewhat rudely disappointed by the petition sent a few weeks ago by the company to the Argentine Railroad Board asking, first, that the works for the present be carried only as far as Punta de las Vacas, allowing fifteen months to get there; second, that a further delay be accorded to reach Puente del Inca, and also a further delay for the rest of the line until the Chilian tunnels be finished; and, third, that four years more be allowed for finishing the tunnel section.

A return fast express from Buffalo and the West to New York was put on the New York Central Railroad recently. It is the return train of the Empire State Express, and accomplishes the run from Buffalo to New York in only 35 minutes more than is consumed in running from New York to Buffalo. The train has been made a permanent feature of the passenger traffic and is scheduled to leave Buffalo at 1:15 P. M., arriving in New York at 10:30 P. M., taking 9 hours and 15 minutes. Five cars now form the train each way. Stops are made at Rochester, Syracuse, Utica and Albany.

The Schenectady Locomotive Works are building and have nearly completed a new foundry to be 100 feet × 384 feet, and to be well equipped with modern appliances, including the Sturtevant system of heating and a 15-ton Sellers traveling crane. When completed the present foundry will be converted into a cylinder shop, and all of the tools now used in the machine shop for boring and finishing cylinders will be moved into it and arranged for the rapid handling of work. It is expected that this change will increase the capacity of the works from 400 locomotives per year to 450 per year.

The First Order for "Railway Car Construction."

The following is the first order that was received for "Railway Car Construction," by William Voss, published by R. M. Van Arsdale, proprietor of the NATIONAL CAR AND LOCOMOTIVE BUILDER:

HONOLULU, May 22d, 1892.

Editor National Car and LocomotiveBuilder, New York.

DEAR SIR—I am in receipt of yours of January 28, and for your promptitude in answering, and also the information you gave, you have my sincere thanks. I have perused the descriptive pamphlet of your new book on Railway Car Construction, by William Voss, and am of opinion it is just what I want. Inclosed you will find post-office order for the amount. Very truly yours,

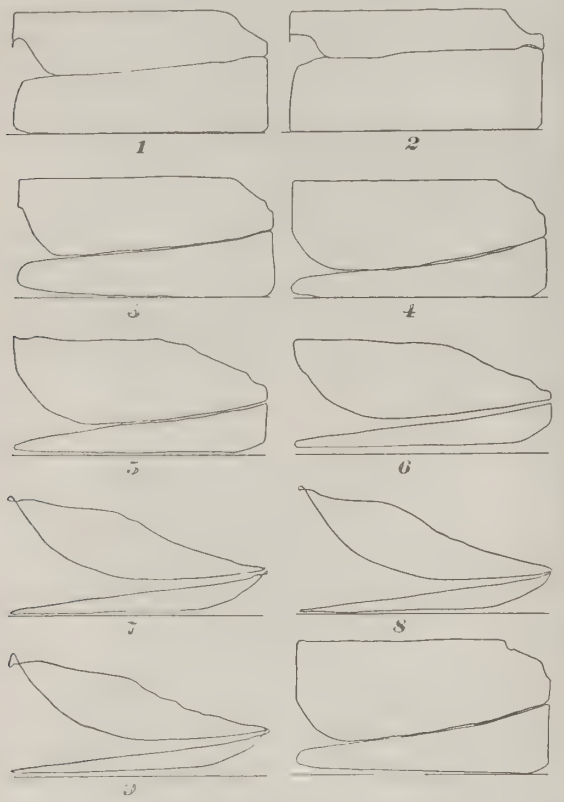
JOHN HUGHES.

American Railway Master Mechanics' Association Convention.

Report of Committee on Compound Locomotives.

(*Continued from page* 102.)

Herewith are shown sample indicator cards from the engines tested. These were selected from the large number taken to illustrate the steam distribution under different conditions of cut-off, speed and steam pressure. The tables on pages 24 and 27 contain the particulars of these indicator diagrams.



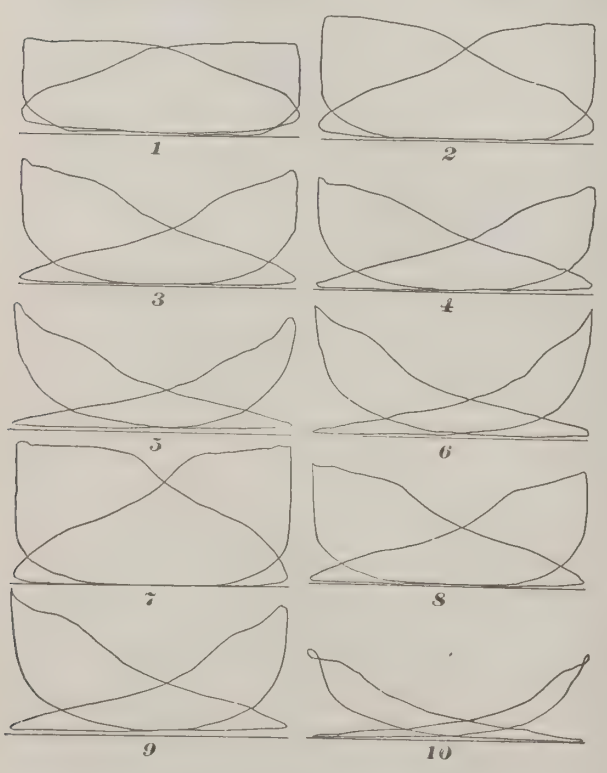
Indicator Cards from No. 827.

DATA TO ACCOMPANY INDICATOR CARDS FROM NO. 827.

No. of card.	Boiler pressure.	Revolutions per minute.	Cut-off.		Mean efficient pressure.		Indicated horse-power, one cylinder.		Total I. H. P.
			H. P.	L. P.	H. P.	L. P.	H. P.	L. P.	
1	180	16.3	21.6	22.6	74.93	95 52	17.43	63.24	161.34
2	179	16.5	21.6	22.6	56.0	111.4	13.03	73.76	173.58
3	179	61.	21.6	22.6	94.66	66.66	82.58	163.35	495.86
4	175	54.2	20.6	21.8	110.2	48.27	85.32	106.7	384.0
5	174	101.6	18.3	19.8	97.3	39.2	141.5	162.2	607.4
6	176	187.	17.3	19.2	81.1	30.9	216.9	239.2	912.2
7	174	203.3	13.3	15.8	53.9	20.5	156.6	169.9	653.0
8	183	182.9	12.3	15.1	51.7	19.7	135.4	147.0	561.8
9	175	233.1	13.3	15.8	50.4	17.9	168.1	169.5	675.2
10	198	92.1	21.1	22.3	122.4	54.4	161.4	204.1	731.0

DATA TO ACCOMPANY INDICATOR CARDS FROM NO. 822.

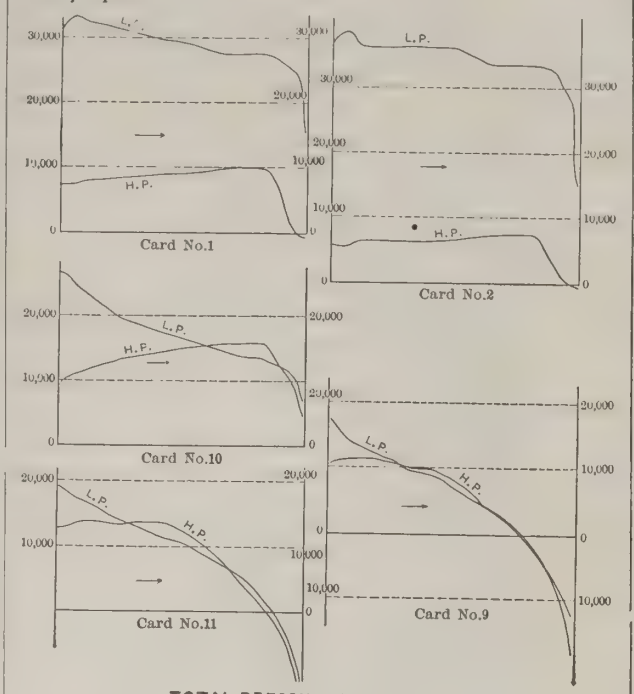
No. of card.	Boiler pressure.	Revolut'ns per minute	Cut-off, mean.	Mean eff. pressure.	Total I. H. P.
1	166	122.	16.2	95 74	770.1
2	176	61.	12.5	106.6	428.7
3	170	133.	8.9	76.12	667.4
4	186	142.	8.9	67.11	628.2
5	173	223.5	7.	51.72	763.7
6	180	195.	5 1	48.54	623.9
7	196	86.8	10.7	124.9	716.5
8	190	111.7	8.9	68.38	504.8
9	197	182.9	7.	66.95	807.7
10	194	168.	5.1	20.69	227.5



Indicator Cards from No. 822.

The only diagrams which are of special interest are compound diagrams Nos. 1 and 2, which were taken when the starting valve was in use and which show clearly the effect of this valve.

A feature of the Vauclain type of compound locomotive which has been generally criticised is the difference between the total steam pressure on the high and low pressure pistons, which tends to rock the crosshead and, hence, induce additional stresses in the piston rods. To show what this amounts to in some sample cases, the accompanying diagrams were prepared.



TOTAL PRESSURES ON PISTONS.
No. 827

The numbers of the indicator cards from which these diagrams were prepared are given with the diagrams. The ordinates of the curves marked L. P. show the total effective steam pressures on the low pressure piston, and the ordinates of the curves marked H. P. show the same for the high pressure piston. The effects of inertia are not considered in these diagrams. Referring to the diagrams for cards Nos. 1 and 2, taken when the starting valve was in use, it will be seen that the greater part of the work was being done in the low pressure cylinder, as was, of course, to be expected. The data recorded on the original cards show the conditions to have been the same for the two cards, excepting difference of one pound in the boiler pressure. The reason for the difference in pressure for the two cards is therefore not apparent.

Card No. 10 shows an excess of about 16,500 pounds on the low-pressure piston at the beginning of the stroke, which is gradually reduced until there is an excess of about 2,200 pounds on the high-pressure piston; the pressures are equalized again toward the end of the stroke. Cards 11 and 9 show a similar crossing of the pressure lines, the greatest difference being about 7,000 pounds in Card 9 at the beginning of the stroke. The indicator cards for this and the following diagrams were selected by your Committee as being good representative cards for different speeds and cut-offs, and may therefore be taken to represent the performance of the engine as fairly as can be done by a few cards.

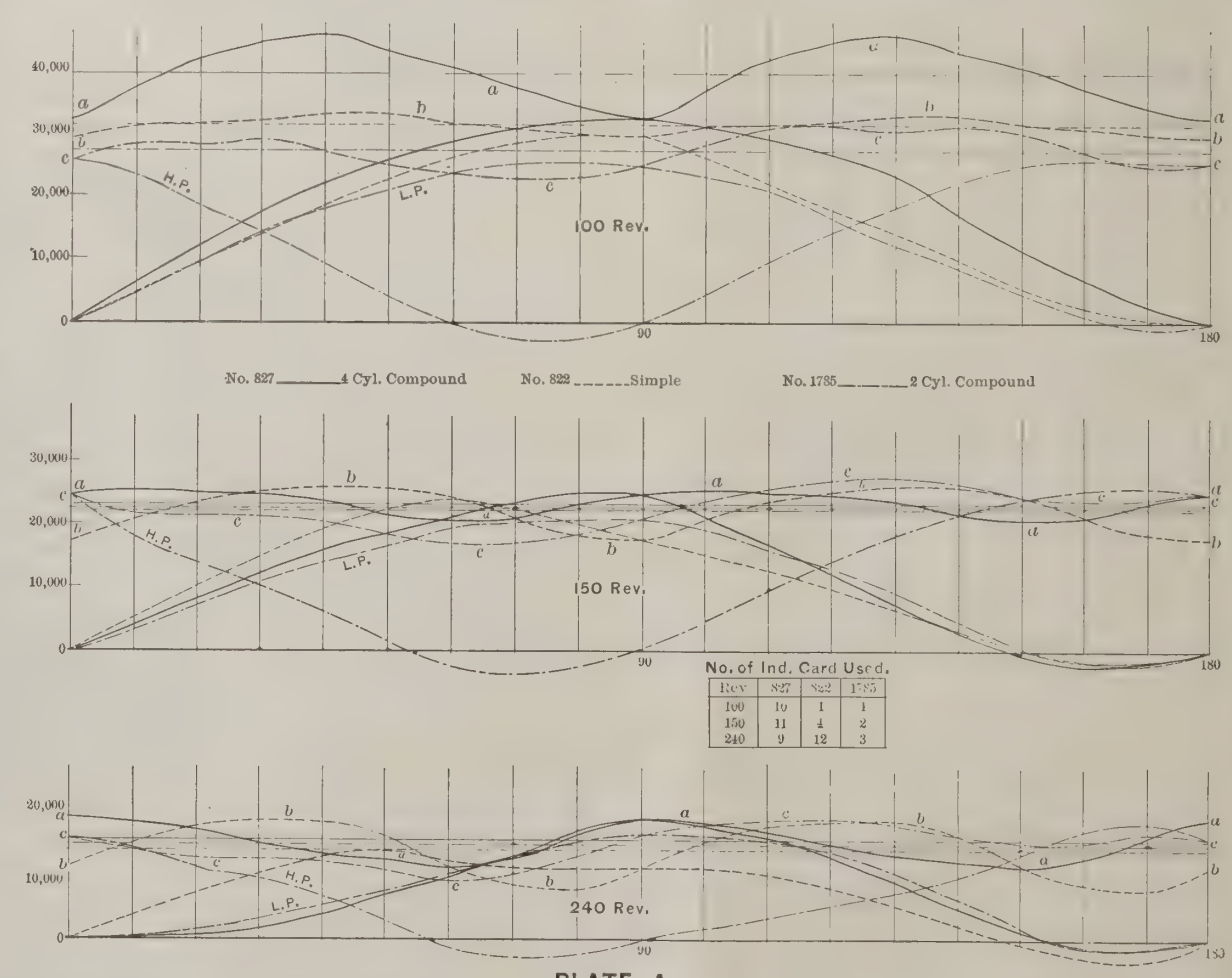
Much has been written concerning the supposed greater uniformity of the rotative pressures in two-cylinder compound locomotives as compared with simple locomotives. In order to determine how well this claim is substantiated in practice, the diagrams shown on Plate A were prepared under the direction of a member of the Committee. These diagrams show the combined rotative pressures on the crank-pins of a simple engine, a two-cylinder compound and a Baldwin compound for 100, 150 and 240 revolutions per minute.

In preparing the data from which these curves were plotted, the total net effective pressure on the pistons was first taken from the indicator cards for every 10 degrees during one stroke, or one half revolution. From these pressures were deducted the pressures necessary to accelerate the reciprocating parts, the formula used being the approximate formula given by Prof. Jacobus, in Volume XI. of the Transactions of the American Society of Mechanical Engineers. The resulting pressures are those actually transmitted to the crank-pin. The tangential components of these resulting pressures were then calculated and plotted as ordinates on the diagrams shown, thus obtaining the actual rotative pressures for one side of the engine. These are shown by the unlettered curves on the diagrams. Finally the two sides, cranks at right angles, were added together, giving the lettered curves on the diagrams, the ordinates of which represent the total rotative pressures exerted at a radius equal to that of the crank.

The full-line curves *a a a* are for the Baldwin compound; the broken lines *b b b* are for the simple engine, and the dash-dot curves *c c c* are for the Schenectady compound. The straight lines represent the *average* rotative effort in each case. It will be seen that for the steam distribution used for 100 revolutions, and with the weights of reciprocating parts as built, the simple engine gives a much more uniform pull than the others. Also, that if the compounds were reduced to the same average pressure, the variation would be nearly the same in both. At 150 revolutions, the four-cylinder compound gives the smoothest line, and the simple engine is somewhat better than the two-cylinder compound. At 240 revolutions the four-cylinder compound shows the least variation and the simple engine the most. These facts are further illustrated by the following table, showing the proportional variation of each engine above and below the mean pressure. It is clear from this, that in this case, at least, the rotative effort or turning movement of the two-cylinder compound is not more uniform than that of other locomotives. There is also evidently a definite combination of steam pressure, cut-off, weight of reciprocating parts and speed for any locomotive with which it will develop its most uniform pull.

As showing in an interesting way the character of the oscillations due to the above (but somewhat modified by irregularities of the road), Plates III. and IV. have been prepared. These give each three 3½-mile sections of the dynamometer diagram paper, and were photographed direct; the record is, therefore, exactly as drawn by the apparatus, with the exception of the letters and figures. The middle sections on each plate are taken at same location on road with each engine, and being at about the same speed, show clearly the characteristic oscillations from each. A study of these plates will give an idea of all characters of diagrams produced by the engines at all speeds. Engine 827 gives a steady diagram up to 22 miles per hour; from 22 to about 48 miles per hour the vibrations are excessive, and at higher speeds again become more uniform.

Engine 822 gives at moderate speeds a much steadier diagram than the compound, having, however, at speeds between 25 and 30 miles per hour, an unsteady period, as with the latter. The results shown on these diagrams, it is believed, give a more comprehensive idea of the characteristic behavior of the engines in pulling trains under all conditions than the partial ones shown by the graphical analysis of certain indicator cards taken at particular points only. It is certain, in any event, that there could be no mistaking the identity of a dynamometer diagram.



No. of Ind. Card Used.

Rev	827	822	1785
100	10	1	1
150	11	4	2
240	9	12	3

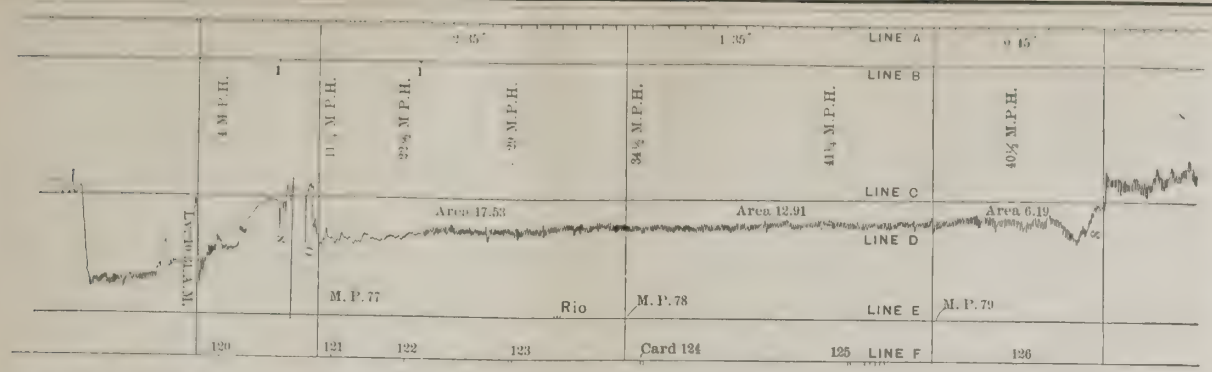
PLATE A.

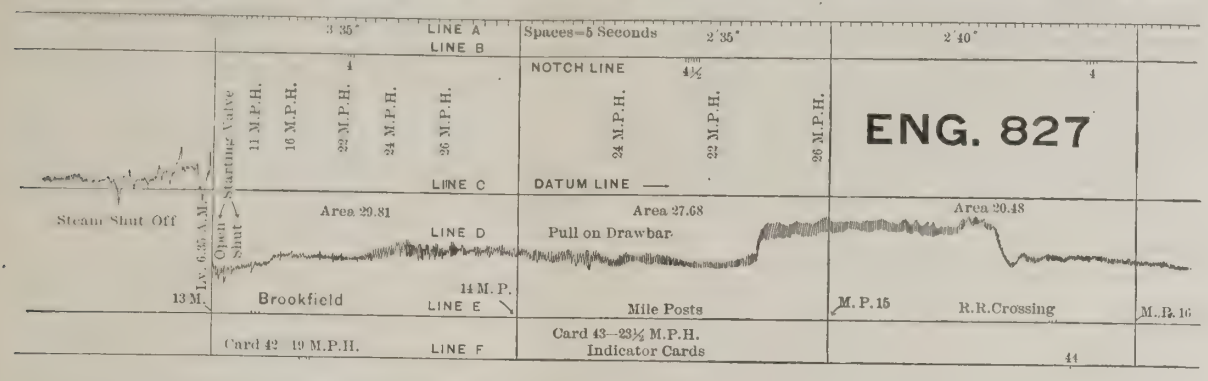
VARIATION IN ROTATIVE PRESSURES.

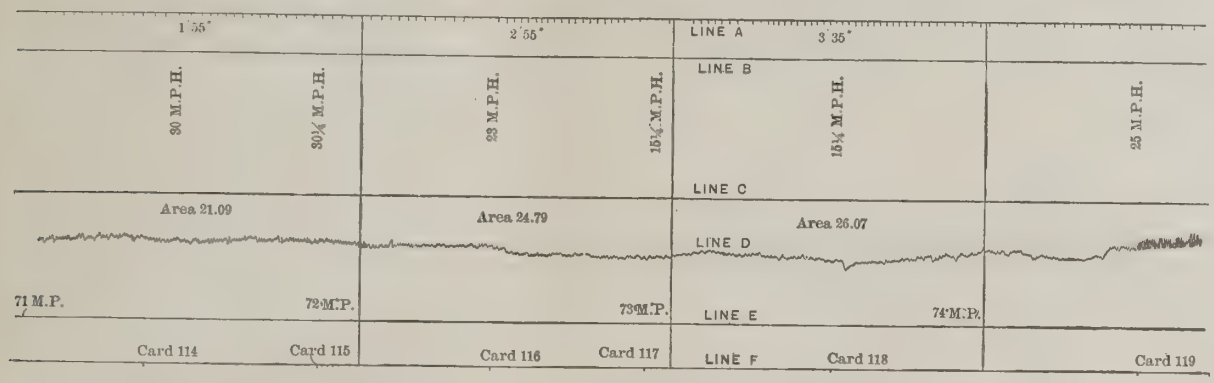
No. of engine.	18½ miles per hour. 100 revolutions.		28 miles per hour. 150 revolutions.		41½ miles per hour. 240 revolutions.	
	Maximum above mean.	Minimum below mean.	Maximum above mean.	Minimum below mean.	Maximum above mean.	Minimum below mean.
827.....	15.1	18.2	10.1	10.2	21.0	25.0
822.....	5.0	6.0	15.9	22.2	33.3	43.3
1,785....	14.9	16.5	25.7	22.8	27.1	41.7

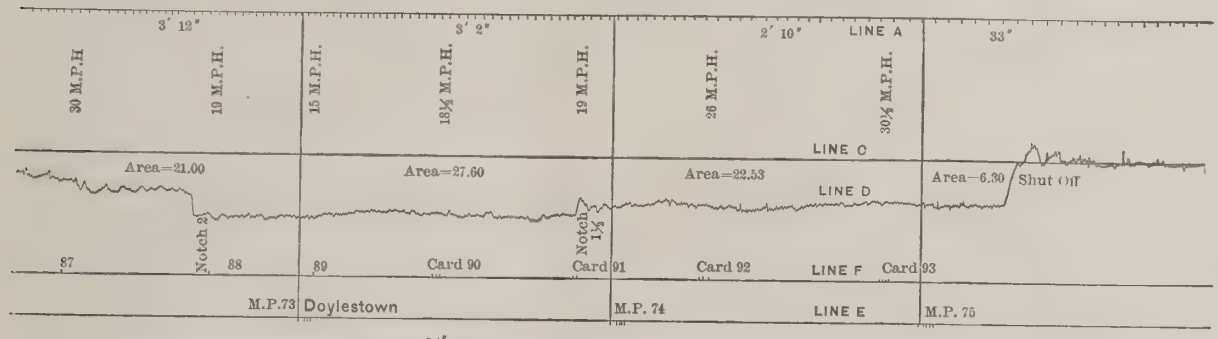
TESTS ON OTHER ROADS.

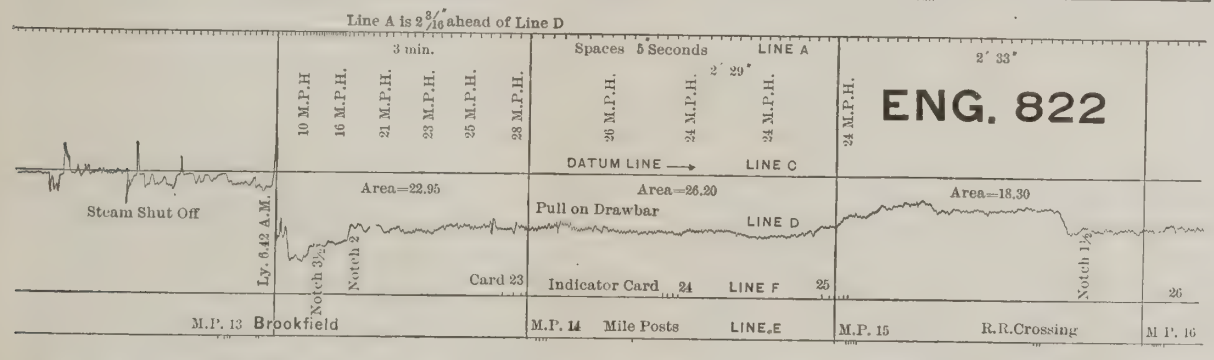
Although the foregoing tests were made with one type of compound engine, your Committee do not wish the results to be taken as establishing the fact that fuel and steam economy may only be expected by the use of that particular type; they have no data at hand tending in any way to an indication of this kind. The use of the two-cylinder type probably involves, in certain cases, a limiting value for the cylinder-volume ratio one, smaller than is the case with the Vauclain type. Whether this limit is one likely to seriously affect the economy and usefulness of the two-cylinder compound or not, is a question your Committee do not feel justified in entering upon at present. They regret, however, being unable to report having made tests with other types,

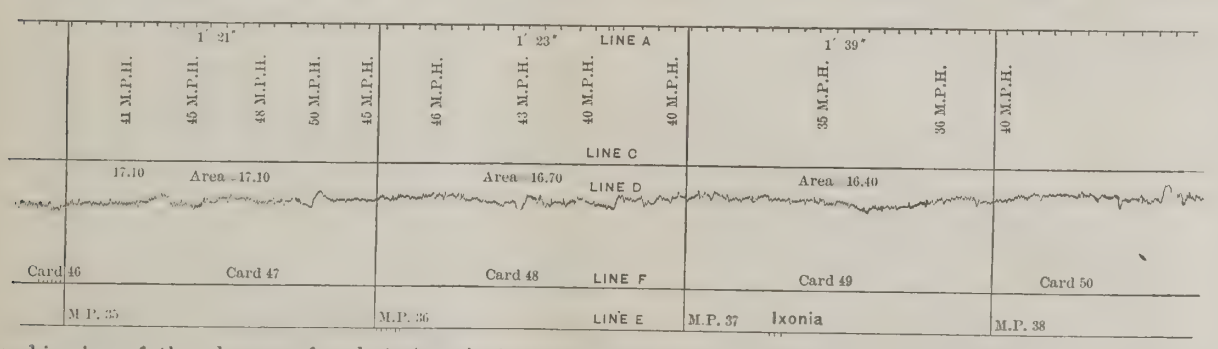












and in view of the absence of such tests submit some results kindly furnished by the officers of other roads. The tables Nos. 8 and 9 contain these results in condensed form, together with the principal dimensions of the engines tested.

TABLE VIII.

DIMENSIONS OF ENGINES TESTED ON SOUTHERN PACIFIC AND OLD COLONY RAILROADS.

No. of engine	374 S. P. / 375 S. P.	367 S. P.	71 S. P.	1,787 C. P.	1,785 C. P.	7 L. A. T.	1,536 C. P.	169 O. C.	235 O. C.	232 O. C.
Kind of engine	Simple.	2 Cyl. Comp.	Simple.	Simple.	2 Cyl. Comp.	2 Cyl. Comp.	Simple.	Simple.	Simple.	2 Cyl. Comp.
No. driving wheels	8	8	8	6	6	6	6	4	4	4
Diam. driving wheels, in.	51	51	54	69	69	56	57	68	69	69
Cyl., diam. × stroke, in.	20 × 26	20 / 29 × 26	20 × 30	19 × 24	20 / 29 × 24	11½ / 19 × 24	18 × 24	18 × 24	18 × 24	20 / 28 × 24
Weight of engine, total lbs.	133,000	139.000	132,250	127,000	129,700	99,330	113,950	.....	97,840	112,000
Weight on truck, to'l lbs.	23,300	29.250	23,700	25.500	33,020	27,460	18,750	.....	34,630	45,700
Weight on driv. wheels, total lbs.	109,700	109,750	108,550	101,500	96,680	71,870	95,200	.....	63,210	66,300
Weight on driv. wheels, per cent.	82.48	78.96	82.08	79.92	74.54	72.35	83.55	.....	64.6	59.2
Grate surface, sq. ft.	30.82	30.82	25.6	28.6	29 26	16.7	25.38	19.2	19 2	19.2
Heat. surf., fi'eb'x sq. ft.	155	155	121.4	.....	.....	.....	129.4	.....	.....	.....
" " tubes, "	1,729	1,729	1.589	.....	.....	.....	1,417.6	.....	.....	.....
" " total, "	1,884	1,884	1,710.4	1,736.2	1,736.2	1,473	1,547	1,262	1,372	1,354
" " per sq.ft.grate.	61.13	61.13	66.81	60.7	60.7	88.2	60.96	65.7	71.4	70 5

An extract from Mr. Small's letter accompanying the report of these tests is as follows:

"These tests were all very carefully made, a competent man being at all times in charge of each engine. All cars were weighed on scales, coal carefully weighed on and off engines and water measured by means of glass gages on sides of tank, tank capacity having been ascertained by use of a meter. Every care was taken to have the results accurate and conclusive."

Referring to the tables, it will be noted that the twelve-wheel Schenectady compound No. 367, when tested against simple engines Nos. 374 and 375, of the same make and genera dimensions, gave a saving in coal of from 7.38 to 14.84 pe cent. and a saving in water of from 6.24 to 13.68 per cent. per ton mile. The greatest saving is shown by the tests between Sacramento and Truckee, in which a large proportion of the work was done on a grade of about 116 feet per mile. On the return trip, down grade, the saving was evidently very small, as shown by the figures for the round trips.

The Baldwin compound was at a considerable disadvantage, and it is but fair to add that on individual trips on which the two train loads were nearly the same for the two engines, the compound makes a much better showing.

The distribution of the work between the cylinders of the two-cylinder compound locomotives in these tests, is given on the sheets of sample indicator cards furnished by Mr. Small, as follows:

PERCENTAGE OF TOTAL WORK DONE IN HIGH PRESSURE CYLINDER.

No. 361.				No. 1,785.			
Cut-off.		Revolutions.	Per c'nt of work.	Cut-off.		Revolutions.	Per c'nt of work.
H. P.	L. P.		H. P.	H. P.	L. P.		H. P.
23	23	60	40.3	20¼	20.5	30	45.0
21⅛	21⅛	96	40.4	19⅛	19.7	50	45.8
20⅛	20⅛	120	39.3	17⅞	18.3	60	46.5
20⅛	20⅛	108	39.2	15¼	16⅛	144	47.8
19⅛	19⅛	120	37.8	12⅛	14⅛	180	51.0
19	19	156	36.6	12⅛	14⅛	240	49.7
19	19	180	32.1	10¼	12⅜	240	48.5
17⅛	17⅛	192	31.	10¼	12⅜	300	52.7
17⅛	17⅛	240	29.5	10¼	12⅜	330	48.5

GEORGE GIBBS, WM. L. LEWIS, PULASKI LEEDS, JAMES MEEHAN, F. D. CASANAVE, A. T. WOODS, Committee.

Following is a synopsis of the very lengthy discussion that followed the reading of the report:

S. M. Vauclain, Baldwin Locomotive Works: Last year I said we had orders for upward of 40 compounds. We had 17 built and delivered of the type your committee have examined on the Chicago, Milwaukee & St. Paul. I said that if the demand kept up at the same rate, before the end of the year we would have taken orders for 100. I am happy to say that before the end of the year we had taken orders for 160. At the present time we have over 200 in service and a number of others under construction. The test on the Chicago, Milwaukee & St. Paul has been a crucial test. It should settle forever the fact that there is economy in compound locomotives. The percentage of economy given you is perfectly acceptable to the Baldwin works. We look for economy with compound locomotives in accordance with the service those locomotives are put to. We have reports from 15 to 20 railroads, and the economy runs all the way from that on the Chicago, Milwaukee & St. Paul (16.9 per cent.) up to 44.9 per cent. The only explanation of such a high rate of economy is that the engines were worked at nearly as full stroke as possible. I am inclined to think that any railroad company that wants to take hold of compound locomotives should have not one built, but 20 or 30. Put them on one division and run them. Take their regular monthly performance and find out.

We offered to build the Jersey Central a locomotive, put it in service two months, and if they had any objection they could send it back to our works. At the expiration of two months they sent us a check with a request for four more of the same kind. The Norfolk & Western bought five. The P. & R. Railroad has, at the present time, twenty-seven in service, and I believe it is due to this railroad company to say that it has taken the proper method of determining whether there is any value in the compound. In regard to the economy reported in regard to Pittsburgh coal, these engines are running on a railroad used to Western coal and the engines are drafted for that purpose. You will notice in the reports also there is a difference of water. I cannot see why there should be any difference in the water per horse power given out in either type. That goes to prove the difficulty of any one arriving at satisfactnry results in regular train service.

Mr. Pitkin, Schenectady Locomotive Works: We have now an equalization of power that is nearly perfect. We have a full stroke variation of power of 2.5 per cent.; at 17 inches cut off a variation of 2.54; at 12 inches, 1.24; in no case a variation of 3 per cent. We went into the compound engine business first simply as an experiment. We have sold only three compound engines under solicitation, two going to the Michigan Central and one just fitted for the Pennsylvania limited train between Philadelphia and Pittsburgh. These are the only three we have built on orders that came directly from the roads. If asked whether we could recommend the compound, we have said no; here is the simple and here the compound: take just what you please. Regarding different types of compound, it is simply a case of the survival of the fittest. Simplicity is the main point to be sought.

Mr. Joseph Lythgoe, Rhode Island Locomotive Works: We have built quite a number of compounds. We are not advocating them strongly. If people want them we will build them. We think we have a good type. We are building a two-cylinder type and making a good satisfactory showing, making a saving anywhere from 15 to 30 per cent. We do not think any are making a saving of less than 15 per cent. In the running of three of our engines on the Brooklyn elevated, changed over from simple to compound, running against 12 engines for some months, it is reported by the railroad people that there is a saving of 27 per cent. against the 12 engines. They did not give the time which it took them to run the 15,000 miles which those engines ran, but it must have taken some months.

Mr. D. L. Barnes: I have a telegram that my man in Mexico has just arrived in Chicago, and that he finds a saving of 15 to 20 per cent. in the Johnstone compound, as near as he can estimate. The Mexican Central Railway is one essentially well adapted for compound locomotives. Coal on that road ranges in price from $18 to $22 per ton, and the saving per year on the basis of the results obtained by our experiments is about $15,000 per engine. On some sections of the road they use wood which is carried over the mountains on mule back, which is expensive.

Mr. H. Tandy, Brooks Locomotive Works: The Brooks people have been so busy that, as a matter of fact, they have not given the time and attention to compounding they otherwise would have done. We did build one of the two-cylinder type and placed it on a road with the understanding that if the railroad people desired to purchase the engine at the expiration of six months they could do so. They did so, so I presume it gave satisfaction. It has been running in freight service since September last and has quite recently been put into passenger service where trains average from 10 to 15 coaches. The engine has been making a saving of from 23 to 27 per cent. We are also building a compound locomotive of the four-cylinder type, for our own satisfaction and amusement principally, and we think we will get quite as good results from that.

F. W. Dean: With reference to the Old Colony compound, it is substantially the Old Colony type of engine. Such alteration has been made as was necessary to make it a compound. It is of the two-cylinder type and the cylinder ratio is as 1.97 to 1. That is rather unusually large for a high pressure cylinder.

Mr. F. D. Casanave: We have had no extended experience on our road with the compounds, having only four or five which were scattered over a large territory; and we have very few

figures to show. From somewhat imperfect trials we have found an economy of about five per cent. in fuel. There is no doubt there is economy in the compound and that it will be greater when the price of coal is higher. It seems to me we should keep to simplicity. The compounding of locomotives is certainly in its infancy. If I was to take money out of my pocket to build a railroad, I hardly think I would go extensively into compounding now. I would wait until it has been shown where the range of economy lies.

Mr. L. B. Paxson: We have upon the Reading railroad some 27 Vauclain compound engines of three classes. We have not attempted to make any scientific tests. We put them to work alongside of some engines doing similar work. We have been watching the quantity of coal used per month. Our engines on the mountains show a saving of coal reported between 25 and 30 per cent., and the fast freight from 12 to 17 per cent. As to the passenger engines, as we only had one making two months' run, it is hardly fair to say what her percentage is, although it is between 9 and 11. All appear to be running along very nicely, giving no trouble except what we had in breaking the men into using them.

Mr. J. N. Lauder: In this question of the desirability of using compound engines as against plain engines, I am inclined to take rather a conservative view. I agree to a certain extent with Mr. Cazanave that, until the railroads of this country know more about the compound, we had better go slow. Out of the present experiments being made will evolve a more economical type of engine. My observation and experience during the past year, both on our own road and from what I know has been done on other roads, leads of the steel depends upon the number of gallons of water the boiler evaporates. A compound does not have to be forced in the same way a plain one does. The action of the gases passing through the tubes and the rapidity of the evaporation keeping the water from the sheets will all act in this direction of increasing the life of the boiler. I believe the lessened repairs on a compound locomotive boiler will much more than offset the additional repairs required on the cylinders and pistons. As to the size of wheel: the compound should be designed with larger diameter wheels, Mr. Lauder thinks. That is not so. It is true that better results can be had with larger wheels, but the same is true with the simple engine. I will agree with Mr. Lauder that a compound can start equally as well as a plain engine. It can even start quicker. Why? Because it hasn't as much steam to get rid of as a plain one. Now, as to special arrangements for draft, size of nozzles, etc.: Our engines are running with the same blast apparatus as the plain. I think the Schenectady people have the same experience. With our system with four exhausts, it is perhaps easier for us to turn our engines out with the same blast apparatus as the plain engine.

Mr. J. N. Lauder: I do not agree with Mr. Vauclain on the question of repairs. I believe his position entirely wrong. I do agree with his statement that the life of the firebox depends on the amount of evaporation of water, but he neglects to mention one of the important features which has quite a bearing on the life of the firebox; that is, the higher pressure we can carry on the compound. I think every railroad man will agree with me that the higher the pressure conclusions of the committee of this Vauclain compound, as compared with the simple engine of similar type, is stated here as 6.1 per cent. one way and 9 per cent. another, and a final figure of 7.6 per cent. Then there is a further conclusion at the end of the report, showing 16.9 and 14.1. Taking even these highest figures as, say, 15 per cent., I should say that is a very low economy to be obtained from a compound engine in freight service, and that we ought to obtain a much higher economy. And I think it has been found to be a common experience that the economy of a compound passenger engine is very much lower than a freight engine. So that we should expect from a compound engine of this type in passenger service not more than 7 or 8 per cent. gain. As a result of more than a year's experience with a two cylinder compound engine we have found from the performance sheets an economy in freight service of 30 per cent. over our simple engine of the same type. We are just now testing this engine in passenger service. As a result of our experience with this engine, I would go a little further than Mr. Casanave in his remarks yesterday, and would say that I would not hesitate at all, if I were to buy locomotives for myself with my own money, to buy compound locomotives for freight service. I believe that the principle is correct from an engineering point of view, and I have no doubt it will become in time the prevailing practice.

Prof. A. T. Woods: Referring to the diagram of rotative pressures in the report, I would say that those diagrams were obtained, as stated, from indicator diagrams which are also given in the report. As there are only 9 or 10 cards figured altogether, it is not safe to draw a general conclu-

TABLE IX.—COMPARATIVE TESTS OF COMPOUND AND SIMPLE LOCOMOTIVES

	On Southern Pacific Railroad.														On Old Colony Railroad.					
Location of run	Sacramento and Truckee.		Sacramento to Truckee.		Bakerfields and Los Angeles.				Bakersfield and Tulare.		Sacramento and Oakland Pier.			Oakland and Mendota.		Oakland and Mendota.		Boston and Fall River.		
No. of engine	375 S. P.	367 S. P.	375 S. P.	367 S. P.	374 S. P.	71 S. P.	1,301 C. P.	367 S. P.	374 S. P.	367 S. P.	1,787 C. P.	1,785 C. P.	7 L. A. T.	1,536 C. P.	7 L. A. T.	1,536 C. P.	7 L. A. T.	169 O. C.	235 O. C.	232 O. C.
Kind of engine	Simple.	Compound.	Simple.	Compound.	Simple.	Simple.	Simple.	Compound.	Simple.	Compound.	Simple.	Compound.	Compound.	Simple.	Compound.	Simple.	Compound.	Simple.	Simple.	Compound.
No. of trips { Round	13	18	—	—	3	1	2	4	5	5	5	5	5	4	4	7	7	4	4	4
No. of trips { Single	—	—	13	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Distance, miles, per trip	239	239	119.5	119.5	336	386	336	336	126	126	172	172	172	339	339	339	339	98	98	98
No. loaded cars, average	11 5/6	10 17/18	11 3/13	10 8/18	11	12.39	11.95	11	32.8	36.6	8.7	9.2	9.3	36.9	27.29	36.4	35.3	44.25	20.32	20.75
No. empty cars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.....	.....	.....
Weight of train, tons, per trip, exclusive of engine and tender	285.97	270.4	277.07	270.7	270.37	272.8	281.24	258.21	659.51	723.91	262.96	274.64	278.3	823.9	620.7	.....	.....	361.9	387.75	390.1
Total ton miles	888,510	1,163,264	430,422	582,271	272,533	91,667	188,992	347,031	415,491	456,063	226,145	236,190	239,338	1,117,421	841,644	.....	.....	35,465	37,990	38,230
Total coal used, pounds	345,460	412,385	272,852	314,326	108,112	44,613	80,387	127,498	48,343	47,355	44,358	39,934	59,211	102,592	76,444	186,841	163,318	30,491	26,858	18,237
Total water used, pounds	1,939,317	2,290,142	1,506,417	1,759,151	570,500	228,958	434,233	673,567	307,631	316,597	294,708	259,442	273,433	634,625	506,983	.....	.....	204,594	174,091	151,615
Boiler pressure, gage	170-180	170-180	.....	.....	.....	.....	.....	.....	.....	.....	155-165	142-165	140-165	.....	.....	.....	.....	142	158	176
Pounds of coal, per ton mile	.389	.355	.634	.540	.397	.487	.425	.367	.116	.104	.196	.169	.226	.092	.091	.....	.....	.860	.707	.477
Pounds of water, per ton mile	2.18	1.97	3.50	3.02	2.09	2.50	2.30	1.94	.74	.69	1.30	1.10	1.14	.568	.602	.....	.....	5.77	4.58	3.97
Pounds of water evaporated per pounds of coal	5.61	5.55	5.52	5.6	5.28	5.13	5.4	5.28	6.36	6.69	6.64	6.49	5.04	6.19	6.63	.....	.....	8.06	8.17	10.12
Percentage of saving in favor of compound:																Per car mile.				
Coal, per ton mile	.....	8.82	.....	14.84	7.38	24.5	13.6	.....	10.76	.....	13.8	.....	15.2	.....	1.08		9.92	44.53	32.52	.....
Water, per ton mile	.....	9.8	.....	13.68	7.28	22.3	15.5	.....	6.24	.....	15.7	.....	12.4	.....	6.1	.....	.....	31.25	13.45	.....
Kind of service	Freight.		Freight.		Freight.				Freight.		Passenger.			Freight.		Freight.		Express Freight.		

me strongly to that conclusion. I do not believe we are going to get such an enormous saving in fuel as some of the claims made would lead us to expect. Thirty-five or 40 per cent. saving is exceptional. If we cannot get more than 5 per cent., as Mr. Casanave suggests has been obtained, I do not think it will pay any railroad to use compound locomotives, because they must necessarily cost something more. The repairs must be something more; how much none of us know. We will not know until five or six years service has been had. The first cost we know pretty nearly to be something more than a plain engine. Unless we can get an equivalent in the saving of fuel for this increased first cost and the necessary increased cost of repairs, there is no earthly object in making the change. I believe in certain localities you are going to get saving enough to warrant you in going ahead with the experiments. The higher the cost of fuel, the greater the gain of the railways from that particular type of engine. I believed one year ago that the compound must be specially designed for special work. My experience has modified that, and to-day I think a compound can be designed that will have as wide a range of service as the simple engine. The engine I have had the most experience with has been used on a variety of work, on fast express freight and running on suburban trains of 8 to 10 cars, making 11 stops in 9 miles. This compound has done as good work, and in some cases better than the plain engine she was designed to compete with. In one instance only has she failed to do the work as well as the plain engine—that is in very quick work. My experience has led me to believe that for passenger work the wheel should be larger. That I believe is in the same line as the experience of other men. I propose to go farther and build more of these same engines with six-foot drivers, and increasing the stroke from 24 to 26 inches. This will, I believe, give us an engine that will do our passenger work in every respect as well as the plain engine. I believe there is enough in the compound to warrant all our leading roads in spending some money to develop the engine and bring out the better type. It will take much more careful and able designers to build a compound than to design and build a simple engine. That the simple engine is almost stereotyped is probably the reason. With the compound there will be undoubtedly a variety of types, and it will be a question of the survival of the fittest. When these engines come to the time for repairs—when they begin to get old, then will come the crucial test. There is one peculiarity about our compound that surprised me—the facility with which it will get a train from a state of rest up to speed. The engine we have been experimenting with will get a suburban train from a state of rest up to speed fully as quick and I think quicker than the plain standard. The quality of the exhaust is so different that it takes special appliances, arrangement and designing to bring out the full benefits of this quality in the exhaust. The exhaust must necessarily be very soft and light compared with the plain engine. That is what we compounded the engine for, to get more out of the steam. We may have to do a great deal more of experimenting before we get the draft just in the condition to give the best results. What accomplished most with us was to increase the diameter of the stack and make it bell mouthed at the bottom. The reason is, that owing to the softness in the escaping steam it spreads very rapidly after leaving the nozzle. I think a good deal of that steam in the ordinary pipe strikes the inside of the smoke arch outside of the exhaust pipe and thereby makes a "mixing up." By making the bottom of the stack of bell mouth shape, the steam readily goes out, giving a clean, smooth exhaust. At present, with this engine, we have no trouble in carrying 190 pounds and handling our steamboat train of 10 and 12 cars, with the fire door open sometimes nearly all the way up the hill, something you could hardly expect with the plain engine.

Mr. Vauclain: Mr. Lauder has alluded to repairs, stating that the compound would require additional repairs. I dispute that on this ground: The repairs to the cylinders of the compound will perhaps be slightly greater. But have we nothing to offset this? What is the life of the firebox of the ordinary locomotive and what does it depend on? The life carried the sooner the firebox will wear out. If you can secure 15 per cent. saving, I believe you are warranted in using the compound.

The convention here adjourned until the next day.

Tuesday morning the discussion was resumed as follows:

Mr. A. E. Mitchell: On January 1 we bought from the Baldwin Locomotive Works five compound locomotives, weight about 205,000 pounds apiece, with cylinders equal to 24 × 28 inches. These engines were bought to place in service on the Delaware division on the hill, where we require three engines to get one train up the hill, the distance being eight and a quarter miles. We figured the tractive power of one of these engines was equal to that of two consolidation engines. Since they have been in service they have pulled through the duty expected of them. We are burning a cheaper grade of coal than we were using on the simple consolidation engines.

One fireman can easily fire the engine, maintaining 180 pounds of steam. We are not throwing any fire from the stack, and therefore we are not liable to settle for fire claims to property along the line. That, I think, is going to be one of the main points with the compound, in addition to the saving of fuel.

Mr. McBeth: I do not understand how it can be stated that the two-cylinder compound does not ride as easy as the simple, or as the four cylinder type. I have ridden on Schenectady compounds down grade at 30 to 40 miles per hour, with especially arranged loose drawbar between engine and tender and experienced no abnormal oscillation.

In regard to the exhaust tips: We are using a five inch tip in the exhaust pipe, and we have no trouble for steam. Our service is very hard. Some of it is 125 feet to the mile, where we have to run our trains very fast. We burn the average coal. As to fires I feel safe in saying (and we are running through a dense wilderness) that our chances on fires are 30 to 40 per cent. less with these compounds than they would be otherwise. I have just got through making a test on the Central Vermont railroad with one of our engines and a simple Baldwin engine that showed a saving of 30 to 35 per cent., and the evaporation was 8¼ against 5½. We made that experiment on a piece of road 30 miles long, 10 of it uphill, on a grade of 37 feet to the mile. Compounds are going to be very successful with us I think. There may be a little question about repairs, but we have not observed so far where they are greater than on a simple engine.

Mr. F. W. Dean: The Old Colony compound, when she first came out, had considerable side oscillation. That almost absolutely disappeared upon taking off the cylinder head of the high-pressure cylinder and turning off a quarter of an inch, and giving more volume for the compression to take place in. It was noticed that the side oscillation increased as the engine got loose in her housings, but now it is very difficult to see any such oscillation, and if the cylinder heads were thick enough to be turned off still more, there would be no evidence whatever. I made the cylinder heads thicker than was necessary for strength, anticipating I might have difficulty with excessive pressure. That difficulty can be made to entirely disappear by giving sufficient clearances—I do not mean valve clearance, but I mean clearance volume between the piston and the cylinder head, or, going up further, to the valve faces.

Mr. Wm. Forsyth (C. B. & Q.): In the further discussion of this subject I think we ought to take up the report of the committee as presented by Mr. Gibbs. It is probably the best piece of work on locomotive tests that has ever been presented to this association, and the committee deserve a deal of credit for their accurate and complete work. In looking over the first part of it I find that they do not ask us to accept their figures as conclusive, that they think that the subject ought to be continued for future trials. The report covers, of course, only one small phase of the subject—that is, a comparison of the Vauclain engine with a simple engine of a similar type. And that is still further narrowed down to a test of these engines in freight service, so that there is still a large scope on the subject of compound engines in the matter of testing other types and in testing them in passenger service. The superior economy given in the final sion. They are given simply for what they are worth as illustrations. They do seem to show that the claim for a much more uniform rotative effort of the two cylinder engine is not substantiated. Now, of course, some of the saving there is due to the higher pressure. How much is due to that higher pressure, it is difficult to say. In order to get some idea of it I made a little hasty calculation; saying we were cutting off to about half stroke at 180 pounds, and you raised the pressure to 200 pounds and cut off sufficiently early to take advantage of it, and there was a saving of something like 10 per cent. If that would hold that would reduce our combined saving in both cases, coal and water, to about 8 per cent. Of course, in that it is not possible to make an exact calculation of the loss by condensation in the two cases. I did not include that at all.

Mr. J. N. Barr: We know that the compound is economical where the work is steady and uniform, as in marine and stationary work. I have gone over the experiments by Hirn in Germany, and I failed to find in those experiments that he feels satisfied that you can obtain an economy of 10 per cent. by compounding over the best construction of simple engines, and that is only where you can compound engines and adapt them to the work to be performed and keep everything uniform. It may be that the compound engine is better able to meet the variable requirements of railroad service as a locomotive than the simple engine, and it may be decidedly the other way. We do not know. I like Mr. Paxson's idea very much of taking a division and putting thereon engines, half of them compound and half simple, instructing the engineers as carefully as possible, trying to remove any prejudice, and then let them go, and let the results tell the story.

Mr. Pulaski Leeds: My General Manager has been very much interested in these tests and in the report of this committee. When he found I had got the data on which these reports were to be based he said to me: "What do you think of them." I said, "Well, Mr. Metcalf, it is like this. We are asked to pay from $750 to $1,200 extra for a compound engine. That engine makes 46,000 miles a year. We will say that her repairs and coal, allowing that we will make allowance for a sinking fund in order to duplicate her, will run for about five cents per mile. She will burn $1,800 worth of coal. Allowing that we make a saving of 10 per cent., we have $180 absolute gain in fuel. Out of that we must take 6 per cent. on the $750, and must be preparing a sinking fund. Figuring it all up it leaves us about $80 as a gain.

Mr. J. H. Setchell, Pittsburg Locomotive Works: We are constructing a compound locomotive, and we expect by giving an increased heating surface, a much larger boiler, and all the other advantages which we can over the plain engine, to show a saving equal to any of our competitors.

Mr. C. E. Smart: The reason why the Michigan Central, having two compounds, did not continue to build or buy them is because we found that in order to get the best results from the compound engine it was necessary that the engine should be worked to her maximum capacity. I believe that is the experience of those who have tested the compound engines. That being the case on the Michigan Central, if we were to have 15 or 20 compounds running in the one direction heavily loaded, in the other direction there would not be half the work. Where we were making a gain when heavily loaded, it would be neutralized on the return trip. I have never claimed more than 12 to 15 per cent. of saving in favor of the compound even under the most favorable conditions. A short time ago we made a test, and the figures showed a saving of 15 per cent. in favor of the compound. There was a saving in the water of only 7.4 per cent. The test extended over a period of some four or five days and covered a mileage of 1,892 miles, drawing 45 cars.

Mr. R. H. Soule: I think that the Norfolk & Western railroad has, during the last six weeks, really had a very exceptional experience in this matter of compound locomotives. In the early spring we ordered 15 ten-wheel passenger engines of the Baldwin Locomotive Works. We took at first five compounds. We were to give our opinion in one month after these engines were put into service as to whether or no the remaining ten engines should be simple or compound. The compounds were similar to the simple

engines, but the Baldwin people were authorized to make such changes in the design as were necessary to introduce the compound principle, and to secure any legitimate advantages. They increased the strength of the boiler, so that the pressure might be run up to 185, against 160 that they were carrying. They also wanted to increase the diameter of the driving wheels in order to get the corresponding benefit from the slower piston speed and slower valve speed and better distribution of the steam. It was necessary to lengthen the engine a little, about ten inches, which was added to the flues. Otherwise the engines were about the same as the simple. We distributed these engines on the two general divisions of the railroad, so as to get results from two independent sources. The results were watched by careful men, they reporting the work of the engines, not taking any account of the water evaporation. We also had a close test of coal consumption and water evaporation. We received reports from three sources and averaged them all. The facts gave us a saving of 20 per cent. in fuel, and 10 per cent. in water. We recommended that the additional ten engines should be compound.

M. N. Forney: I am an agnostic. I feel that the advantages and superiority of the compound have not yet been fully proved. It is generally acknowledged that compounding increases the weight of the locomotive considerably—to that extent it is a disadvantage. The simple engine man might take that extra weight and put it into a boiler, getting a larger boiler on the simple engine. If the simple engine has an advantage in weighing less, you have a right to avail yourself of that. In all the discussion in nearly every instance the compound engine advocates have asked for odds in their favor. It seems to me the conditions should be exactly the same under all the circumstances. At this meeting we have been presented with additional evidence contained in the report of this committee. It is presumed the committee went at it in an entirely unprejudiced way. I have taken for example the two groups of tests made with the simple engine with a pressure of 180 pounds, using Braceville coal. I have taken the consumption per ton per mile, and find it is 1.029 lbs. per ton mile; have taken the compound and find it burnt 1.018, making an economy of 8½ per cent. in that group of tests. I would venture to say that any gentleman here present having charge of the locomotives of a railroad might make that difference in two simple engines by painting the smokestack of one sky blue—by being careful you can easily make that difference. Now, taking the test made with Braceville coal with 200 pounds pressure: They showed an economy of 19½ per cent. That is asking odds of the simple engine. It is not a fair test. The question is whether that amount of percentage is sufficient to justify us in using a new system. I made some very rough figures in regard to that. An ordinary engine burns about $2,500 worth of coal in a year; fifteen percentage of saving would amount to $375. To do that you have a locomotive that costs about $750 more than the simple engine; allow 10 per cent. of that additional investment and you have a saving of $300 in the course of a year where coal does not exceed $1.50 per ton. It is very easy to use up $300 on extra repairs. One of the most important things in building locomotives is to get locomotives that will do their work. Have you any evidence yet to show, or is it probable, we can get an amount of service out of the compound equal to that of the simple engine? If, on careful tests, we find the compound will make a saving anything like that claimed for it, we will all have to use them. This association should go very slowly, however. It strikes me that a good plan would be to appoint two committees on this subject, one consisting of the advocates of the compound and the other of agnostics like Mr. Barr and myself, who should obtain the very best possible simple engines. Then have a competitive test, and let the advocates of the two systems have charge of the tests. I think then we would be more liable to get at the true state of the case. In the burning of Pittsburgh coal the compound shows considerably less saving than when burning Braceville coal. It would be a disadvantage to the compound if it is not able to burn all qualities of coal.

At the close of the discussion an invitation was tendered the members to visit the Schenectady Locomotive Works. On a motion it was voted that the members would go in a body.

The Committee on Air-Brake and Signal Instructions made the following report—

Air Brake and Signal Instructions.

Your committee which was appointed to act jointly with a committee of the Master Car Builders' Association, for the revision of the rules and instructions for the operation and maintenance of the air brake, has conferred with that committee, and we have agreed upon certain alterations, which are embodied in the accompanying rules and instructions. A number of alterations have been made, and it is now believed by your committee that some definite action should be taken. Managers of our lines are asking for some uniform code of rules for the inspection and care of air brakes.

Since our last convention, when no definite action was taken, several roads have felt it necessary to have some rules for their employés, and have adopted those which were presented to the convention last year. Others have adopted rules of their own, taking the committee's report last year as the basis. In this way the longer we delay in adopting a uniform code, the greater will be the difficulty in bringing it into general use. We cannot doubt that experience will indicate some desirable changes in these rules; but we shall more quickly bring them to a state of perfection by using them than in any other way.

In the discussion of these rules by the various railroad clubs, much diversity of opinion existed as to the proper limits for piston travel in the adjustment of the brake shoe slack. It was considered desirable by the committee that the limits of the piston travel for adjustment (4 inch and 8 inch) upon cars, should remain, and it would also seem desirable that whatever limits are decided upon for cars should, for the sake of uniformity, apply to driver and tender brakes. The decision of the committee on this point of piston travel was affected by the fact that, while metallic brake beams and the Master Car Builders' standard brake gear are being now quite generally adopted, there are still a great many air brake cars with springy brake beams and light brake gear, which would not be capable of such adjustment as could be maintained with substantial beams and brake gear. We therefore call your attention again to the necessity of using substantial brake gear and metallic brake beams on tenders and wherever the air brake is applied.

There can be no doubt that the air brake service upon our lines will be greatly improved by a thorough system of inspection and adjustment; and it is equally true that such service will be materially improved by a system of instruction and examination for emyloyés, and your committee would urge that these rules and a system of examination of employés be entered upon by railroads at once.

R. C. BLACKALL, DAVID CLARK, Committee.

In a supplementary report the committee recommended that the main report be changed in the same manner as recommended at the M. C. B. Convention, and further recommend that:

"When under a full application the brake piston travel is found to exceed 8 inches upon a passenger car or 9 inches upon a freight car, the brake shoe slack must be taken up and the adjustment so made that the piston shall travel not less than 5 nor more than 6 inches. Changes corresponding to this should also be made in the first paragraph of page 6, in the clause relating to adjustment upon page 13, and in answers to questions 56, 58, 111, 112 and 131." These recommendations were adopted.

Tests of Steel and Iron.

Your Committee appointed to investigate the critical temperature of iron and steel, also any other questions relating to steel and iron that the Committee may consider of value, beg to report as follows:

A number of tests were made to throw some light on the matter of what is known as the critical temperature of steel, it being generally understood that at a blue heat, or at a temperature of about 600 degrees, steel is extremely liable to crack in bending.

The experiments of your Committee demonstrated that this is a fact, and that steel that will bend when cold, or at a red heat, is extremely liable to crack when bent at a temperature varying between 500 and 800 degrees. The results of these tests are given in the following table.

Make.	Number of piece.	Temperature degrees.	Thickness of plate, inch.	Results.	Angle Degrees.
A	1	800	3/16	No cracks.	180
	2	800	3/8	Cracked.	170
	3	700	7/16	"	180
	4	600	3/8	Broke off.	90
	5	600	3/8	No cracks.	180
	6	600	3/8	"	180
	7	600	3/8	Cracked.	170
	8	500	3/8	"	180
	9	500	3/8	"	180
	10	400	3/8	"	180
	11	cold	3/8	No cracks.	180
	12	"	3/8	"	180
B	1	800	1/2	Cracked.	180
	2	600	1/2	"	160
	3	600	3/8	"	174
	4	600	1/2	"	137
	5	600	3/8	"	170
	6	500	5/16	"	180
	7	500	3/8	"	175
	8	500	3/8	"	180
	9	500	1/2	"	172
	10	500	1/2	"	170
C	1	800	3/16	Broke off.	90
	2	800	3/8	Cracked.	180
	3	700	3/16	Broke off.	90
	4	600	3/8	Cracked.	175
	5	600	3/16	Broke off.	90
	6	500	3/8	Cracked.	132
	7	500	3/8	"	155
	8	400	3/8	"	170
D	1	800	7/16	No cracks.	180
	2	600	7/16	Cracked.	170
	3	600	7/16	"	180
	4	600	7/16	No cracks.	180
	5	500	7/16	Cracked.	180
	6	400	7/16	"	175
E	1	800	5/16	No cracks.	180
	2	600	3/8	Cracked.	180
	3	600	5/16	No cracks.	180
	4	600	5/16	Cracked.	180
	5	600	5/16	No cracks.	180
	6	600	5/16	"	180
	7	500	5/16	"	180
	8	400	5/16	"	180
F	1	800	1/2	No cracks.	180
	2	600	5/16	Cracked.	154
	3	600	1/2	"	170
	4	500	7/16	"	180
	5	500	3/8	"	175
	6	500	—	—	—
G	1	800	5/16	Cracked.	180
	2	600	5/16	No cracks.	180
	3	500	5/16	Cracked.	180
	4	500	5/16	No cracks.	180
H	1	800	11/32	No cracks.	180
	2	700	3/8	Cracked.	180
	3	650	5/16	"	165
	4	650	3/4	No cracks.	180
	5	600	3/4	Cracked.	180
	6	600	5/16	"	180
	7	600	3/8	No cracks.	180
	8	400	5/8	"	180
I	1	800	3/8	No cracks.	180
	2	700	1/2	Cracked.	180
	3	600	3/8	"	90
	4	600	3/8	No cracks.	180
	5	600	7/16	Cracked.	146
	6	600	3/8	No cracks.	180
	7	400	7/16	Cracked.	170

In this table the different makes of steel are designated by letters from A to I. The temperature at which the test was made is shown in the column marked "Temperature." Under the head of "Results" is given the condition after bending. In making these tests, the steel was first bent to a right angle, or 90 degrees, and then hammered down until it began to give decided signs of cracking; if no cracks appeared, it was hammered down so that the sheet closed on itself, which is designated by an angle of 180 degrees.

In a number of cases cracks did not begin to appear until just about the time that the sheet was bent to 180 degrees.

It is not thought desirable to give the names of the different steels tested, but the lot marked "A" was taken from an old firebox which cracked badly and was removed after ten months' service. It is of the same make as the lot marked "F." It will be seen from the tests that steel which had been in a firebox, but had cracked after making a short service, gave, in some cases, very good results in the bending test at 600 degrees, and also at 800 degrees, and cold. It will also be observed in looking over these tests, that while some steel cracked at 800 degrees, others did not, and also the same steel in some cases cracked at 800 degrees, while the second test, made at the same temperature, does not show any cracks.

Your Committee was inclined to be of the opinion that if steel tested at the blue heat stood the bending test without cracking, there was strong probabilities of its being a good material for firebox purposes. However, an observation of the tests, as shown in the table, indicates that this position cannot be maintained. This is further shown by the fact that old fire-box steel, marked in the test as "A," stood portions of this test better than some new steel of the same make, and also better than some new steel of other makes.

The conclusion of your Committee, from tests made, is that steel which stands a bending test at a blue heat, does not necessarily give material which can be depended on not to crack in service.

It was suggested that iron plates, on account of the tradition that they were less liable to crack in the firebox, would resist fracture at a blue heat better than steel. Your Committee accordingly made a number of experiments of the same kind with the samples of the best iron boiler-plate made in this country and England, the result being that at a blue heat the tendency of the iron plate to crack was decidedly greater than is the case with steel. This, in the opinion of your Committee, corroborates their position that the bending test at a blue heat is not a criterion on which to base an opinion of the suitability of material for firebox purposes.

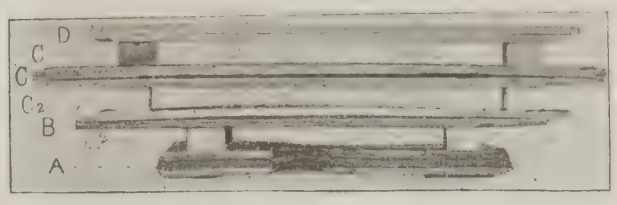
The tests of steel at a blue heat, as referred to above, do not really introduce any new information so far as the fact of the liability of steel or iron to crack at a blue heat is concerned, but the tests, as shown, would seem to imply quite clearly that material which will stand this test is not necessarily good material, and it also illustrates the importance in handling any material of this kind of working it either cold or at a red heat.

The samples tested were heated in muffles in a specially prepared furnace made of fire brick. The temperature was taken by a pyrometer in the lowest and hottest muffles, and by thermometers in the muffles occupying higher positions. It was found that by this means a very equal temperature could be maintained, and your committee believes that the figures, as given in the report for the temperature of the pieces when tested, is very nearly correct. When the pieces were removed from the muffles they were quickly bent at right angles, the time consumed being about thirty seconds, after which the bending was continued by hammering the ends together until the fracture began to manifest itself.

ETCHING.

A number of tests were made by etching new and old steel the etching mixture being diluted sulphuric acid. Some quite interesting results were obtained from this. The etchings of all the new steel showed a decided uniformity of structure in the same pieces, except where laminations occur, but there is quite a difference in the appearance of the etchings of different brands. Some were much more quickly attacked by the etching fluid than others, and appeared to be coarser in grain. The most interesting results were observed in etching steel which had been in service in fireboxes. In several samples of steel three-eighths of an inch thick, there was a decided difference shown in the structure of the middle portion of the steel as compared with the two outside edges, there being a zone through the center of the piece about an eighth of an inch wide which the etching fluid attacked most actively. The outer eighth of an inch on either side showed but little more effect than new steel, while the inner eighth of an inch was spongy and appeared to be an entirely different material.

The print of the most pronounced sample, which was only two years in service, is attached to this sample report, and shows clearly the phenomenon described. See *A*.



A number of tests were made of old sheets varying in service from 80,000 to 600,000 miles, and some of the pieces which had only made 80,000 miles showed more of a disorganization of the interior of the sheet than the samples which had made 600,000 miles. Unfortunately, it was not possible to obtain etchings of these sheets when they went into service, but your Committee is of the opinion that this phenomenon would not have been observed in the new sheets. Further tests should have been made of new sheets, and of the same sheets after they have been in service, to establish this point.

The spongy interior of several of these pieces was carefully removed by a narrow tool, leaving the outside and inside of the sheets, about one-eighth of an inch in thickness, intact. Of these two pieces, the one next the fire sprung inward toward the fire about one-sixteenth of an inch in a length of eight inches, forming an arc of a circle; the one next the water remaining almost perfectly straight. The phenomenon, perhaps, indicates a permanent expansion of the sheet on the side next the fire.

Your committee was of the opinion that in cutting out the central portion of the sheet it might have been strained by the action of the tool, and to verify this point a piece of new steel was cut and split in the same manner; this showed no camber whatever.

It has been claimed that annealing a sheet would restore it to its original condition; with this object in view your Committee took a piece of the same sheet, carefully annealed it by heating to a red heat, then placing it between two pine boards, and allowing it to remain until cold. The center was then cut out as in the other cases, and the result was the same as with the piece not annealed. This apparently clearly demonstrates the fact that annealing an old sheet of steel does not restore it to its original condition.

If there is a similar set or permanent expansion in the ends of the staybolts next the fire, it may be that it somewhat accounts for the cracks radiating from the staybolts, which are so frequently found in steel sheets.

It is impossible to say how much influence the apparent disintegration described above may have on the life of the sheet, but it was observed that some firebox sheets which had made a service of 600,000 miles did not show as much susceptibility to the action of the etching fluid as some other sheets which had made a service of only 80,000 miles, and which then cracked badly.

The idea has been advanced to us that the chemical actions of the fuel and waters may have a decided influence in shortening the life of firebox sheets, but we have made no investigations to determine this.

The facts as stated above in brief are as follows: 1. There is apparently a disintegrating action taking place in the center of the sheet. 2. The side next the firebox seems to be permanently expanded, giving it a camber when set free by being sliced off from the rest of the sheet. 3. Annealing after service does not remove this phenomenon. 4. The above phenomenon may be a strong argument in favor of thin sheets.

STEEL TUBES VS. IRON TUBES.

The information as to the relative merits of steel and iron for boiler tubes has excited considerable discussion, but your committee has very little definite information to present.

We are, however, advised that in the case of a large number of steel tubes the results, so far as wear is concerned, have been unfavorable. The following definite experiment, however, has been made: An engine was equipped with 114 iron tubes and 113 steel tubes on December 20, 1890. The iron tubes were placed on one side of the center, and the steel tubes on the other side of the center of the boiler, the flues being divided by a vertical line through the center of the flue-sheet. On March 9, 1892, the flues were all removed. Seventeen of the iron tubes were condemned on account of pitting and corrosion, while 64 of the steel tubes were condemned for the same defect. This would indicate that steel tubes are more affected by corrosion than iron ones. Further experiments and information in this line, however, is desirable in order to fully settle this question.

In order to determine the temperature of a sheet in a firebox when the engine is being fired up, an experiment was made with two thermometers.

One thermometer was placed in the water space and the other in a drilled staybolt, with the bulb at the inner sheet. The boiler was a stationary vertical one, and was fired with oil and rosin wood. The maximum difference in temperature between the water and firebox sheet, as shown by the thermometer, was about 25 degrees.

STAYBOLTS.

In the matter of staybolts your committee has very little to present; an endeavor was made to devise an apparatus that would represent a staybolt riveted into the sheet, to be subjected to vibrations in order to determine which materia

would resist the greatest amount of vibration. This arrangement gave in vibration a full motion of three thirty-seconds of an inch at the end of the staybolt, and at the same time allowed a stress in the direction of the length of the staybolt somewhat similar to that which occurs in boilers, the strain put on the staybolt being equivalent to a pressure in the boiler of 150 lbs. per square inch. A test was made in this way of four pieces of mild machinery steel; the average number of vibrations before breakage was 21,539, the pieces standing respectively 7,950, 96,060, 14,168 and 54,358 vibrations before breaking.

Eleven samples of iron were tested in the same way, the average number of vibrations before breaking being 6,568, the lowest being 3,120, the greatest 12,480. The result of these tests would indicate that steel is a better material for staybolts than iron; at the same time the experience of a number of the members of your committee with steel staybolts has been seriously against them. They failed in service, and deductions drawn from the test, as made, are entirely misleading. Your committee does not feel that in this they have added anything to the subject of a proper method of determining the suitability of any special material for staybolts.

The investigation, as described above, is not sufficient to enable your committee to offer any specific directions for drawing up specifications for iron and steel for firebox purposes, and they therefore have in this particular no definite recommendations to make.

The results of the investigations so far may be summarized as follows: 1. Steel or iron should not be worked at a temperature between a normal temperature and a perceptible red heat. 2. So-called "blue heat" makes steels and irons more brittle, but some are apparently less affected by the "blue heat" than others. 3. The test of steel or iron at a "blue heat" is not a criterion by which to judge the action of the same in a firebox. 4. Iron at a "blue heat" is more seriously affected than steel. 5. There is apparently a mechanical disintegration going on in plates exposed to the action of fire, water and scale in a firebox. 6. Steel tubes do not seem to be as durable as iron tubes.

WILLIAM SMITH, J. N. BARR, A. W. QUACKENBUSH, P. H. PECK, D. L. BARNES, Committee.

The report was accepted, and the committee continued for another year.

Mr. William Smith: I would like to ask the steel manufacturers here what value they place upon a chemical analysis in the manufacture of firebox steel?

Mr. Wellman (Wellman Iron & Steel Co.): From a manufacturer's standpoint I consider the chemical analysis of steel of the utmost value. We could not pretend to run our works without daily and constant analysis, both of the raw material that we use and the finished product; but I would not want to depend entirely upon chemical analysis as showing me whether steel is all right. We have got to have a combination of the chemical and physical analysis, and even that does not tell the whole story.

Mr. J. N. Barr: If a steel maker is making steel from material obtained from certain ore in a certain locality, and has been manufacturing steel right along for years, and has demonstrated that he is turning out a first-class quality of steel, can he then call in a chemist and analyze a deposit of ore from some other section and be satisfied that he is going to give his customers as good an article of steel as he has done previously?

Dr. Huston (Lukens Steel Co.): We cannot tell entirely by chemical analysis what results we are going to get. We must have a certain chemical analysis to produce a certain article, but that analysis does not always produce that article.

Mr. Wellman: I should say that an analysis was only an indication. If from our experience the analysis showed that the ore would make good steel, I should be inclined to try a small batch of it. I am not a chemist, but I think I could tell without fail from analysis of an ore, if the chemist would give us a complete analysis; but they do not do that: they do not tell us more than half the story.

Mr. D. L. Barnes: As a member of the committee I would like to say a little about this report. Our chairman has said that he believed an etching will show more about steel than a chemical analysis. I believe he is right, if he would go further and say that an etching will show more about the mechanical structure of the steel—that is, whether it has laminations or cracks. But so far as showing whether the steel is good for a firebox or a boiler steel, or a tank plate, I do not see how it can be done from an etching, because an etching of one good solid sheet of steel will look almost exactly like an etching from another good solid sheet. Referring to a report and the sample marked "A," the result there shown is exactly what would occur if there was a very bad lamination for the plate. I heard of a case the other day where a brick had accidentally gotten into an ingot and they made a boiler plate of it, and when they put it in the firebox it was found to be laminated. The edge of it looked not much different from the picture "A." I would hesitate myself to say that the etching of a firebox plate shows that the plate deteriorates in the center, or anywhere else after service.

The question of lamination has been avoided by the committee, yet I do not see why it is not a very important one. We avoided it, I suppose, because we could not say anything about it that was of any great value. One laminated sheet last year cost a locomotive builder $2,000. I suppose the steelmakers replaced the sheet for $15—a very small percentage of the total cost. In making specifications for steel sheets for fireboxes some directions should be given to discover whether the sheets are laminated or not. Etching the edge will not show what is in the middle of the sheet, and one cannot bend a sheet to see the cracks and then use it afterward. Perhaps the only way to do is hold the makers of the steel responsible. Steel has in one case at least been guaranteed for two years against lamination, with the understanding that the steel maker should pay the cost of replacing bad sheets. If there is a lamination in a firebox plate at first it will always be there; if there is none when it is made then there will never be any. In regard to the test of staybolts, from subsequent examination made since this report, I am of the opinion that the reason why there was such a wide difference in the results from vibration tests lies in the way the staybolts were fitted into the sheet. If you take a hard steel sheet and tap a thread into it with a sharp tap, and then screw into that a soft iron staybolt, which is a little larger than the hole, that staybolt will be ruined because the hard sheet will cut into the staybolt and start a crack. A loose staybolt will generally last longer than a tight one, because it has less bending strain. So I believe if these tests were repeated, and care was taken to have the hole in the sheet cut smooth, and the thread on the staybolt round at the bottom, with a corresponding rounding on the bottom of the tap for the sheet, I think the results would be more nearly uniform.

Mr. Forsyth: I agree with the conclusions of the committee that steel tubes do not seem as durable as iron tubes. Steel blooms can be made cheaper than iron. A steel tube at the same price as iron tube I do not believe as good. In addition to the trouble from corrosion with the steel tube we have found trouble from the welding. It is very difficult to weld a steel tube and make it stand in locomotive service.

Mr. Charles Blackwell: The report shows that it is unsafe to base conclusions on one test from one piece of steel. There should be several experiments. In some cases I have tried at the same temperatures one piece would break, and another piece would not break. I have here two samples, each of which we tried to raise to exactly the same temperature. One broke almost in two. In the other the sides were almost brought together, and there was hardly a crack to be seen. They were cut off the same sheet. This shows that a very little difference in temperature and conditions will give a very different result. When coupons from steel plates are tested for tensile strength, elongation and reduction of area, it is absolutely necessary that the coupons be carefully handled, and not subjected to improper treatment. They should be separated from the sheets by means of long bladed, sharp shears, so as to prevent distortion. Distortion results in a change in tensile strength and percentage of elongation.

Should the compound be bent so as to require straightening flatwise, it should be done by means of a flatter applied to its side, and then little or no damage will ensue, provided light blows only are used. But if the coupon is bent edgeways, or curled, from the use of shears with too short a knife, it is imperative that the piece be not struck upon its edge. It should be trued up upon a planer or equivalent tool, otherwise considerable deviation from correct results will follow when pulled in a testing machine. The effect of moderate punishment of test pieces seems to be an increased tensile strength, a reduction in percentage of elongation and a diminution of reduction in area. The error is sufficient sometimes to condemn a good sheet, for excess of tensile strength and deficiency of percentage elongation and reduction of area, and may cause serious delay to work in the shop before the cause is discovered and satisfactorily explained to the consumer.

Dr. Huston: Steel coupons should never be cut off with shears. It should be done with a milling machine or with a planer.

Mr. J. S. McCrum: I agree that the question of the price of steel is consideable of a desideratum. I would inquire of some of the steel makers whether they think they could make a better steel?

Mr. Jackman: I can say for Hussey, Howe & Co., of Pittsburgh, that we were, 20 years ago, making firebox steel, but the price of that material has gone down of late years to such a point that we could not make enough profit to induce us to stay in that line. If the railroads of this country would pay what we consider a fair price, the successors of that firm would go back into the business.

MR. WELLMAN: I have been making firebox steel for some 18 years. I have been trying to make the very best article I could possibly make, and to-day I am still doing the same. The price does not have any influence upon the manufacture at all, and I believe we are making a better steel to-day than I have ever made in the last 18 years, and when I cannot make the best firebox plate that can be made, then I will quit the business.

The report of the Committee on Uniform Locomotive Performance Sheets was then read.

Uniform Locomotive Performance.

Your Committee, appointed to investigate the subject of uniform locomotive performance statement, beg to submit the following:

First. We would recommend that all passenger and freight mileage be based on actual miles run, and five per cent. to be added to all freight mileage; that all engines in construction or snow-plow service be allowed at the rate of ten miles per hour; all engines in switching service be allowed at the rate of eight miles per hour, no percentage to be added to this class of mileage. All other runs of less than one hundred miles freight or passenger, actual miles to be allowed, regardless of what engineers and firemen may be paid for such service. No extra mileage should be allowed going to and from the roundhouse. When an engine is assigned to more than one class of service, the mileage should be computed, so as to show each class of service.

Second. In the distribution of fuel one cord of wood should be rated as one ton of coal, and all expense in connection with the handling of fuel, either wood or coal, to be included in the cost of same; all coal to be rated at 2,000 pounds per ton.

Third. In the distribution of illuminating oils, only such oils as are used in the head-lamps and lamps and torches belonging to engines should be shown on the performance sheets.

In the distribution of lubricating oils, we believe all oils used in lubricating engine, including that used in packing driving-boxes, tender and engine trucks, while engine is undergoing general repairs, should be charged to repairs. All lubricating oils used on engine after engine goes into service, to be charged on cost and performance sheets as lubricating oil against engine.

Fourth. In showing the miles run to one pint of oil, the engine, valve and illuminating oil should be separated, showing the miles run to one pint of each, and a separate column be made on engine's statement, giving the total average for all kinds of oil. All waste used by engineers and firemen, and by wipers for wiping engines, should be shown on performance sheet, and the miles run to one pound of waste given. Waste used on engines while undergoing repair should be charged to repairs.

Fifth. In the apportionment of the expense of labor for repairs of engines, we believe no labor should be charged for repairs other than performed by mechanics, helpers and those actually working on repairs; laborers, sweepers, sanding and turning table, cleaning roundhouse and other outside work in and about roundhouse, should not be charged to repairs, but should be charged to locomotive service.

All undistributed labor, such as superintendence, clerks, etc., should be prorated over general shop expense. Cost of engine repairs, caused by accident due to other than engine failures, to be not shown on performance sheet, but such expense should be kept separately and charged to the department responsible for the accident.

Sixth. All new engines purchased or built to take the place of those worn out, should not be charged to repairs of locomotives. All general repairs of engines, including overhauling, etc., except the above mentioned, to be charged to repairs, except the application of new devices, such as air-brake equipment, extension front end, steam heating appliances, train signal or smoke consumer. We believe the application of these new devices should be charged to new equipment or betterment. In the charges for materials used on engines, including files, chisels, other small tools and the engine's equipment, should be charged to repairs of engines We would recommend the preparation each month of a performance sheet in detail for each division of the road, the same to contain the following information:

Engine No.
Name of engineer.
" fireman.
Mileage, each class separately.
" total.
Tons of coal.
Cords of wood.
Oil, each kind separately.
Waste, pounds.
Cost of coal.
" wood.
" oil and waste.
Wages of engineer and fireman.
" hostler, wiper and miscellaneous labor.
Cost of material for repairs.
" labor for repairs.
Cost, total.
Cost per mile run for fuel.
" " oil and waste.
" " engineer and fireman.
" " hostler, wiper, etc.
" " repairs, labor and material separately.
Total cost per mile run.
Miles run to one ton of coal.
" " pint of engine oil.
" " " valve oil.
" " " lubricating oil.
" " " illuminating oil.
" " " all kinds of oil.
" one pound of waste.
Average number of loaded cars hauled per train.
Average number of pounds of coal consumed per car per mile.

To place the rating of empty cars on a uniform basis, your Committee would recommend the following:

In figuring loads all box, stock, refrigerator and furniture cars, 30 feet long or over, three empties to be considered equal to two loads; gondola and flat cars, two empties to be considered equal to one load.

GEO F. WILSON, J. S. MCCRUM, JOHN PLAYER, JAS. MCNAUGHTON, JNO. A. HILL, *Committee.*

This report was referred back to the committee with instructions to cut out the clause recommending that the cost of engine repairs caused by accident be omitted from the performance sheet, and with further instructions to prepare an interchange sheet showing proper recapitulation of the information contained in the original.

The convention then adjourned for the day.

On opening the convention on the morning of the third day the report of the Committee on Standard Bolts and Nuts was taken up.

The conclusions arrived at by the committee were as follows:

The duties of your committee, as before mentioned, being of so general a character, no very particular recommendations can be made, and we will therefore close by

First, Commending and emphasizing the United States standard, and urge upon all a rigid adherence to same.

Second, That it is practicable to maintain the United States standard with the methods and gages available.

Third, The committee recommends the adoption by the association of the United States standard for nuts, based on rough size, regardless of finished nuts.

WM. SWANSTON, WM. GARSTANG, T. W. GENTRY, W. LAVERY, A. DOLBEER, L. R. POMEROY, *Committee.*

After considerable discussion the report and recommendations were amended and adopted as follows:

First, That this association commends and emphasizes the United States standard and urges upon all a rigid adherence to the same and deprecates the use of more than one set of dimensions for each size of bolt and nut, and urges all railroad officers to discontinue the use of screws which are not of standard sizes.

Second, That it is practicable to maintain the United States standard with the method and gages available.

Third, The committee recommends the adoption by the Association of the United States standard for nuts, based on single size, regardless of finished nuts.

Fourth, That the committee be instructed to prepare a circular calling attention to the importance of maintaining the standards of screw threads, and that the secretary send copies of this circular to all members, general superintendents, general managers, and railroad newspapers.

The report of the Committee on Boilers for High Pressure Steam was then read. The drawings illustrating the report were received too late to be engraved and appear in the report as presented to the convention. We withhold this report to be presented with illustrations in our next issue.

The Committee on Subjects reported that in addition to the continued subjects they would suggest the following, which were adopted:

Standard diameters for wheel centers and tires, for both larger and smaller sizes than those now accepted.

Boiler attachments and means for increasing their safety and lessening the number of holes in boilers.

Extent, utility and cost of malleable castings.

Attachment between engine and tender, to increase safety and prevent tender from mounting foot board.

Foot steps and hand rails.

Best means of preventing the smoke nuisance, when using soft coal in cities.

The following officers were unanimously elected for the ensuing year:

President—John Hickey.
Vice-President—William Garstang.
Second Vice-President—R. C. Blackall.
Treasurer—O. Stewart.
Secretary—Angus Sinclair.

A resolution was adopted expressing the thanks of the Convention to the railroads and those who had shown courtesies to the members, and to the *Railway Age and Northwestern Railroader* for its daily reports of the proceedings of the convention.

The St. Charles Car Company is now building the 1,000 box and 500 coal cars for the Missouri Pacific contracted for some time ago. The order for 1,500 cars for the Atchison, Topeka & Santa Fe has just been completed.

The gas works of the Safety Car Heating and Lighting Company, at Chicago, last month supplied 2,761 cars with gas, which the company considers a remarkable showing. This does not include the Chicago & Norwestern cars, that company being the owner of its own plant.

The labor unions that attempt to prevent men who do not belong to them from earning their living, and that act as tyrants, with power of life or death over those who do not agree with their decrees, are the worst enemies of the workmen, and are out of place in a free country. They had better emigrate in a body to some country where they can force everyone into their union, decree ten dollars a day of five hours as the minimum wages, and enforce it—until they starve. They will, of course, have no hated employers of labor there, and no industries.

In this country every man has an "inalienable right to life, liberty and the pursuit of happiness," and any body of men seeking to take away these rights is as much a tyrant and a traitor to free institutions as would be a dictator who should seek to establish slavery both of whites and blacks in this country. Such attempts at tyranny by labor unions invariably destroy the union and leave the workmen worse off than they were before.—*Engineering and Mining Journal.*

Arbitration Committee's Decisions.

The Arbitration Committee of the Master Car Builders' Association met at the Windsor Hotel, New York City, May 20 and 21, to pass upon a number of cases of dispute regarding bills for repairs and renewals of defective car details under the Rules of Interchange. The members of the committee present were Messrs. F. D. Casanave, M. M. Martin, G. W. Rhodes. John Mackenzie and J. W. Marden.

The first case considered was that of the Missouri Pacific *vs.* the Chicago, Burlington & Quincy. The Missouri Pacific rendered a bill against the C., B. & Q. for replacing a pair of wheels under a C., B. & Q. car on account of a broken wheel rim, stating that a piece ten inches long was broken out, and that it had evidently been cracked for a long time, and probably the cracked piece striking a frog caused the break to occur. The C., B. & Q. objected to the charge and referred to the rule that wheels shall not be charged to the company owning the car if the cause for removal is due to broken or chipped rim not caused by rim being hollow.

The Missouri Pacific then claimed that the broken rim was due to a "seam crack" instead of striking a frog (which was merely supposed by the clerk writing the letter) and that this was a proper charge against the car owner. Affidavits from the foreman at the point where the change was made and from the joint car inspector affirmed that the cause of removal was "seam crack."

The C, B. & Q. denied the right of a road to change its claim as to the cause of damage.

The committee decided that as the bill was based on a broken rim, and as there was nothing in the correspondence to indicate that the brake was in consequence of rim being hollow, as provided for in (*h*) Rule 9, it was improperly rendered. Had this wheel been seamed so as to be dangerous the car should have been rejected or wheel removed and bill rendered against owner on account of "seams;" but as it remained in service until broken and bill was then made on account of "broken rim" and not on account of "seams" it should not be paid.

Mr. Rhodes, being interested in this case, was not a party to this decision.

The body of a Southern Pacific box car was destroyed on the Northern Pacific. In making its bill for body of car the S. P. Co. stated that the trucks of the car should be delivered at Sacramento. The Master Car Builder of the Southern Pacific afterward directed by telegraph that the trucks be delivered f. o. b. cars Portland. This was done. The S. P. Co. then demanded $105 as freight charges on the trucks to Sacramento.

The N. P. Co. objected to paying the bill on account of the telegram referred to directing the trucks to be delivered at Portland, claiming that had it been advised that the trucks should be delivered at Sacramento it might have retained them rather than pay the freight charge.

Decision: According to Rule 24 trucks removed from cars destroyed on foreign lines shall be delivered free of charge to the nearest point on the road owning the car. When a road destroying a car desires to return the trucks to the owner and asks for shipping directions, it is expected that, in accordance with the rules, the nearest point on the owner's road will be designated. With such informaretion, the road desiring to return the material can determine whether it can best afford to pay freight charges or retain the material and compensate the owner as otherwise provided in the rules. In the case under consideration the delivery of the trucks at Sacramento would have involved such large freight charges as to make it a positive loss to the party returning the trucks to that point. This, in the opinion of the committee, would have been an unjust hardship, and the bill in question should not be paid.

The St. Louis, Alton & Terre Haute rendered a bill against the S. Louis & Southwestern upon a defect card issued by an inspector of the latter road for "one spotted wheel" under a line car owned by the former road.

The St. Louis & Southwestern objected to paying for the wheel as the defect was "shelled out" spots, one for which the owner is responsible under the rules.

The committee sustained the objection of the St. Louis & Southwestern to paying for the wheel, and took occasion to say that while it was undoubtedly a mistake on the part of its inspector to give a defect card in such a case, yet this did not justify the St. Louis, Alton & Terre Haute in taking advantage of the mistake in view of the clearest evidence that the road was not responsible.

Severe and long continued application of the brakes on the steep descending grades of the Colorado Midland proved too much for the wheels of two Chicago, Rock Island & Pacific cars, and breakage occurred from their being highly heated. Defect cards were issued for the damage and bills rendered upon same. The Colorado Midland objected to payment, claiming that the wheels failed under fair usage, although the same was necessarily severe on, particularly, one down grade on its road.

In its decision the committee quoted the requirements of rule No. 2, that cars must be returned in as good general condition as when received. As it was acknowledged that the damage resulted from the unusually severe conditions of the service on the Colorado Midland, the committee considered it unfair to place upon the car owner the burden of loss through damage under extraordinary conditions, and while in service for the company responsible for such conditions. The Colorado Midland should pay for the damaged wheels.

The next case gives an amusing instance of the ingenuity sometimes exercised to saddle our misfortunes upon others when we can. A Chesapeake & Ohio car came home last November, after a trip over the Louisville, New Albany & Chicago, decorated with a defect card of the latter road, stating that one cracked truck bolster was the trouble. A bill rendered in accordance therewith by the owner was objected to by the L., N. A. & C., on the ground that the defect card was issued through the ignorance of the inspector, and that the truck bolster had cracked under fair usage.

The C. & O. stated that the defect card was only four days old when the car came home, and that the defects were all fresh, and everything indicated that the car had been off the track while on the L., N. A. & C., thus making that road responsible. Accepting this evidence, and considering it sustained by the defect card issued, the committee decided that the L., N. A. & C. should pay the bill.

The body of a car belonging to the Hutchins' Refrigerator Company was destroyed on the Kansas City, Fort Scott & Memphis road. Some second-hand wheels were put in the trucks and they were returned to the owner, but three of the wheels were found to have worn flanges and one of the wheels was badly rail-worn. The owner asked to be reimbursed for replacing the three wheels with worn flanges.

The K. C., Ft. S. & M. claimed that the wheels were about as good as those it removed from the truck, and as the flanges were not worn vertically beyond the limits allowed by the rules the owner should accept them, although admitting that the flanges had a flat but not exactly vertical surface extending one inch from tread.

The committee held that if the flange be worn to a flat surface extending an inch or more from the tread, the wheel should be condemned, and that the use of the word "vertical" in Rule 3 must be construed as only approximately describing this flat surface.

Malleable iron is the standard material for drawbars on the Cincinnati, Jackson & Mackinaw. After some wanderings one of its cars came home equipped with cast-iron drawbars, and bearing a Chicago, Milwaukee & St. Paul defect card calling for "one wrong drawbar in place of cast drawbar." The owner demanded payment for a malleable iron drawbar. The delivering road objected to pay but for a cast drawbar as per its defect card, stating that the car had two cast-iron drawbars when received by it, and there was nothing to indicate that malleable iron drawbars were standard to the car.

Decision: The failure of the owner to require a defect card properly representing the defects for which the delivering road was responsible renders it liable to the extent of its neglect, and having accepted its car with a card calling for a cast-iron drawbar it is bound by that specification.

The next case furnishes another lesson to railroads that use or accept "pass cards" or cards other than the regular M. C. B. defect card in car interchange.

The Lake Shore & Michigan Southern rendered two bills against the Burlington & Missouri River road for damages to cars acknowledged in a "pass card."

The B. & M. objected to payment, stating that these pass cards are no authority for charges.

Decision: An accepting road can only protect itself by requiring the authorized M. C. B. defect card. Its acceptance of any other card invalidates its claim.

The Burlington & Missouri River road rendered a bill against the New York, Chicago & St. Louis road for replacing a draft spring in one of its cars upon a defect card issued by the latter road seven months previous. The New York, Chicago & St. Louis objected to the bill on the grounds that this long service of the spring after it was carded as defective showed that it was not defective in such a way as to be unsafe, and that the defect card was improperly given. The Burlington & Missouri River road claimed that it received the car with the defect card and made the repairs noted thereon, as it did not consider the car safe in that condition.

The committee, in rendering its decision that the bill was in accordance with the rules, took occasion to call attention to the fact that it is a fixed and equitable principle that a railroad must be the sole judge of the proper condition of cars to run over its line.

The Cudahy Packing Company refused to pay for repairs made to one of its cars by the Chicago, Milwaukee & St. Paul in replacing journal bearings and one stirrup hanger, claiming that the stirrup hanger could not fail from ordinary usage, as its construction and material were such as to make it last during the life of the car unless broken by rough usage; and that, as the journal brasses were such that they could not go down on the journal far enough to cut off the supply of oil, no matter how badly worn, and as care is taken before the start to have the brasses of these cars in condition to run a round trip with perfect safety, it could not have become necessary to replace the same unless they were carelessly burned out.

The railroad company states that the break in the stirrup hanger showed an old fracture due to poor workmanship and quality of iron, and that the journal brasses were worn thin and sharp so that the supply of oil was cut off, and it was necessary to remove them and substitute new ones.

Decision: If a railroad company concludes that the worn conditions of bearings jeopardizes the safety of a car or any of its parts it has authority to change the bearings and charge the owner with the expense. If the stirrup hanger was found upon inspection to be in the condition claimed by the railroad it was justified in making the necessary repairs and chargiug the expense to the owner.

The next case submitted was between the same disputants and in regard to another similar case—the railroad replacing one stirrup hanger and casting on a car belonging to the packing company—the packing company claiming that the damage must have resulted in consequence of bad usage, and the railroad company claiming that the parts were broken in fair usage.

The committee decided that the statement of the railroad as to the circumstance of breakage must be accepted as correct in the absence of any proof to the contrary, and that the bill should be paid.

On Nov. 21, 1891, the Western Maryland road transferred on a switching charge, for the Pennsylvania Railroad, an N. C. R. car to a private siding of a wagon works with which the P. R. R. had no direct connection. Two days later the wagon works were blown down and the car badly damaged. The P. R. R. claimed that the Western Maryland was responsible for the necessary repairs under rule 28.

The Western Maryland claimed that it could not be held responsible for a providential cause, and that in agreeing to rule 28 it had no intention of entering into an arrangement binding upon it beyond what the laws of the country would make any one responsible to another for.

The committee decided that as rule 28 provides that a car damaged upon a private track shall be settled for by the road placing it thereon there is no question but that the Western Maryland should pay the bill. In regard to its position with reference to rule 28, this is not tenable, because that rule is especially provided for the purpose of preventing disputes under the common law in such cases, and that the acceptance or rejection of the Code of Rules must be as a whole.

The Pittsburgh, Fort Wayne & Chicago rendered a bill against the St. Louis, Arkansas & Texas for repairs to the end of a Union line (Fort Wayne) car, amounting to $7.48, on authority of a St. L., A. & T. bad order card acknowledging defects. The bill was objected to by the latter road because the type of card was old, none like it having been issued for several years, that they had no record of it, that the date of card had been changed from 1887 to 1891, and that the inspector who signed the card had not been in the service of the company since 1889.

The P., F. W. & C. showed by its car accountant's record that the car was not on the lines of the St. L., A. & T. during 1887, but that it was on that road from January to April, 1891, and that the car was received from the St. L., A. & T. in April, 1891, by the Illinois Central, and that it was accepted by that road in its damaged condition in consequence of the now disputed card it carried.

Decision: Cards that have expired by limitation are confined by the rules to those issued from September, 1888, to August, 1889, inclusive. The card in question was evidently used for some purpose in 1887, but as the evidence shows that this car was not on the St. L., A. & T. in 1887, but was on that road from January to April, 1891, and was received from there during the latter month in a damaged condition, and with a card specifying the damage, the card clearly performed the function for which it was gotten up. The St. L., A. & T. should pay the bill as rendered.

Comment on "Railway Car Construction."

(*From the Railway Review.*)

"Railway Car Construction," by William Voss, is a handsomely bound and well gotten up book, and contains a valuable fund of information. The different parts of freight cars, bodies, drawheads and attachments, floors and framing, sheathing and roofs, etc., of different kinds of freight cars, such as stock, flat, coal, ore and refrigerator cars, are treated at length, as are also the trucks and car brakes for these cars. The treatment of passenger equipment is even more extensive and contains a great deal of valuable matter. The passenger car framing, as used by several of the large roads, is given in complete form, and also the palace cars built by both the Pullman and the Wagner companies. An appendix is attached to the book giving completely the standards adopted by the Master Car Builders' and the Master Mechanics' Associations. The code of rules governing the condition of and repairs to freight cars are also given. The book is published by R. M. Van Arsdale, Morse Building, New York City.

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GEORGE H. BAKER, Editor.

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Subscription.—$2.00 *a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

SOW THE WIND AND REAP THE WHIRLWIND.

The labor riots in Pennsylvania and Idaho during the month just closed have been the talk of the civilized world for the last few weeks, and will make July, 1892, memorable in the history of our country as witnessing the most daring outbreaks against the peace of the nation since the close of the War of the Rebellion. In each case organized societies of working men have set at defiance the laws of their respective States, invaded premises, violated every obligation of citizenship, and, offering death and the destruction of property as the alternative, forced compliance with their mandates that mills and mines should remain idle unless operated by them, on their terms, and all competitors expelled. In Pennsylvania it required the display of every sword and bayonet in the State, and in Idaho the presence of several regiments of National troops to restore order, the inviolability of premises, and personal liberty.

In neither of the cases, the iron mills at Homestead or the mines in Idaho, does it appear that those engaged in the strikes had just grievances; but whether they were justified in striking or not is a question that was sunk into insignificance when they resorted to violence and force to gain their ends. Then nothing was worthy of consideration but their suppression, which, of course, was speedily accomplished, and hundreds of the offenders imprisoned. Numerous murders were committed in both instances, and those who can be convicted of participation in them will doubtless be made to suffer the penalties provided by the law.

The defeat of these strikers in their defiance of law and abridgment to personal liberty is complete, and no less so is the defeat of their efforts to adjust satisfactory to themselves the conditions of their employment. Their positions have been rapidly filled by the very men they dreaded the most and fought against the hardest—non-union men, and the prospect confronting those who are not staring the penitentiary in the face is unremunerative employment, if any, at unfamiliar work.

This is regarded by some as a persecution of organized labor, depriving it of its rights and its means of subsistence. This is not true in any sense. It is not with organized labor, employing reasonable and legitimate means to better its condition that the intelligent public fails to sympathize, but it is organized labor resorting to force and the destruction of property to compel employers to engage it at its own terms, and resorting to assault and murder to drive away the competition of unorganized workingmen, that the vast majority of reasonable men in this country detest, and are ready to take up arms, if necessary, to suppress.

Public sympathy is powerful, and a just cause, properly conducted, is almost sure to win; but when the peace is broken and the law defied—failure is insured. The violent act is the signal of sure defeat. Those who sow the wind can reap but the whirlwind.

ADVANTAGES OF LARGE BOILERS.

An improvement that secures a valuable and lasting economy, and which of late years has received considerable impetus, and is deserving of more, is the enlargement of locomotive boilers to the limit of weight that can be safely and properly carried.

Even this plain common sense improvement has its opponents in some railroad mechanical officers who think the limits of economy in this matter were reached in the smaller boilers of 8 or 10 years ago; and in some managing officers who fail to see the good in replacing a small boiler that is yet good for years of continued service by an expensive new and larger boiler.

With managing officers the question is simply one of money well expended; and it would seem that there are few ways in which this can be done in railway operating with a greater certainty of prompt and long continued profitable return than in giving a locomotive a liberal sized boiler that will save, in fuel, its cost many times over during its life, instead of continuing in service a small extravagant boiler, though in splendid condition, that "eats its head off" every few years in an entirely unnecessary consumption of fuel.

On another page is given the record of a year's performance of two freight engines, one with a large boiler and one with a small boiler. Both engines were engaged in the same service on the same piece of road, and the fuel economy of the engine with the large boiler, as compared with the other, amounted to practically $1,000 in the year's service.

It may be said that this is not a fairly representative case, because of the high cost of fuel on the Pacific slope; but it will be noticed that the mileage of these engines is low compared with the locomotive mileage of many Eastern roads where coal is cheaper, and it is probable that many cases could be found upon such roads where the difference in the cost of coal consumption between locomotives with liberally large and extravagantly small boilers, approaches the figures of the foregoing comparison.

Several different influences combine to produce the economy resulting from the use of large locomotive boilers, and they are generally very well understood.

While not the chief of these influences, yet the greater weight alone of the larger boiler giving greater adhesive power to the engine, so that the full power of the cylinders may be exerted without slipping of the driving wheels, with the attendant waste of steam and disastrous effects upon the fire, aids materially in fuel economy. If all the cylinderfuls of steam used by an engine with too little weight upon the driving wheels in uselessly slipping the same in a year's service could be measured, it would be found that it would require a good many tons of coal to supply the amount. And if all the unconsumed coal could be measured that is torn from the fire and carried to the smokebox or out of the stack by the fierce draft of the genally high pressure slipping exhausts it would add many more tons to the account.

Nor is this all, for slippery locomotives require sanded rails to give them adhesion when working at their maximum capacity, the clogging effect of which on the wheels of the train necessitates a greater expenditure of power—more coal consumption—to pull the train. Locomotives often have to double hills because of heavily sanded rails, made necessary by deficiency of weight on the driving wheels, and the blame for the extra coal consumption required lies at the door of too small boilers.

Of course the greater measure of economy of large boilers is due to the large grate and heating surface they allow for the generation and absorption of heat—the larger grate surface permitting improved combustion, and the larger heating surface permitting more of the heat of the fire to be absorbed by the water in the boiler.

Another important factor of the economy of large boilers lies in the greater quantity of heated water that can be stored or carried in such boilers over what can be stored or carried in small boilers. This quantity of heated water can be made to assist greatly in saving coal during all emergencies of hard work, such as forcing trains into speed from stops, climbing short, steep hills, etc., as was explained in answer to question of management 38 page 72, May NATIONAL CAR AND LOCOMOTIVE BUILDER. When the construction of the boiler allows a large store of heated water to be held, permitting the injection to be suspended, as described, during tasks of hard work, the reduction in fuel required, as compared with the amount that would be burned during the emergency with the injection continued, amounts to fully 60 per cent., or a clear gain of 40 per cent., the other 20 per cent. of fuel apparently saved having been previously burned to give the store of heated water utilized to such excellent advantage.

When it is remembered how often locomotives stop and start their trains every trip, it will be seen that this is a very important means of economizing fuel. And the larger the water space that the construction of the boiler allows, the greater will be the opportunities to economize in this way. In practicing this method of saving fuel it is necessary to recuperate the store of heated water in the boiler by continuing the injection for some time after steam is shut off from the cylinders while approaching and stopping at stations. The fear has been expressed that this might lead to damaging the boiler by chilling its temperature. As there is always a certain temperature accompanying a certain pressure of steam it is impossible that the boiler will be chilled so long as the steam pressure is maintained unreduced, especially with an injector.

Briefly, the economical advantages of a large locomotive boiler are: Its larger grate surface and its larger heating surface, permitting better combustion and greater absorption of heat; its greater weight, giving more adhesion to the rails; and its larger water space, permitting the accumulation of a large capital of heated water that can be utilized to great economical advantage in emergencies of hard work.

Altogether, these several advantages combine to make a well designed and liberally large boiler the most effective and successful fuel economizer yet brought out in locomotive operating.

SAFETY APPLIANCE LEGISLATION.

It has long been evident to even superficial observers of current affairs that national legislation in regard to the equipment of cars and locomotives with power brakes, under the full control of the engineer, and with automatic couplers of uniform design, was sure to come in the near future. The wisdom of such legislation may very properly be questioned, considering the rapidity with which the railroads, without the coercion of law, are equipping their cars and locomotives with such safety appliances as the proposed legislation demands, and in view also of the fact that the best known appliances for stopping trains and coupling cars are yet in the state of evolution from crude arrangements to the perfected mechanism that the best mechanical ability of the country is working assiduously to hasten and accomplish.

While this is true, yet public sentiment seems to be that the period of transition from hand brakes and non-automatic couplers should be as short as possible, and that legislation is necessary in order to bring this about and have all the railroads adopt such appliances uniform in character and detail.

As this is the public sentiment publicly expressed in the platforms of both the great political parties, to which will be pledged the legislative and executive power of the nation, it is uselessly blowing against the wind to oppose it. Those whom such legislation will affect can most profitably exert themselves in shaping it, or assisting to shape it, so that it will be reasonable and practicable, rather than in opposing and arguing against it.

On another page we give the full text of a bill that is now before the Senate and fairly on its way to become a law, the provisions of which, aside from the too early dates named for them to become effective and some minor matters, are generally fair and reasonable; much more so in fact than any of those hitherto presented, and as much so as any that are likely to be presented.

The element of time is of the greatest importance, and it would seem that if the American Railway Association properly directs its efforts toward modifying the bill so as to properly shape it, rather than to oppose it, a reasonable extension of the time limits, say of about two years in each of the provisions, could be secured. This would be meeting the legislative power half way, and would be a course that would make possible and probable the best results to all concerned.

TESTS OF IRON AND STEEL.

The committee of the Master Mechanics' Association that reported to the last convention on "Tests of Iron and Steel" deserves a good deal of credit for the able and very interesting report it made, and which is given in full on another page of this paper. Having an intelligent appreciation of the importance of the subject, and of its phases most interesting to those who build and maintain steam boilers, the committee gathered all the available information it could and embodied it in its report.

One of the interesting tests made by the committee was that in which a piece of old firebox steel was carefully annealed by heating it to a red heat and allowing it to gradually cool, to test the correctness of the claim that annealing such a sheet would restore it to its original condition. The test did not show that such was the case, or, in fact, that annealing made any change whatever in the condition of the piece tested.

The conclusion of the committee that steel tubes are not as durable as iron tubes agrees with the experience of many who have given the matter attention. In the test made, where a locomotive boiler was fitted with 113 steel tubes and 114 iron tubes, and run for over fourteen months, it was found that 17 of the iron tubes and 64 of the steel tubes were unfit for further service because of pitting and corrosion. As mentioned during the discussion of the report, objection to steel tubes on account of their susceptibility to corrosion is strengthened by the difficulty experienced in welding them so as to stand the severe conditions of locomotive service.

Experiments recently made in England also add color to the belief that steel is not as good as iron for boiler tubes, because of its behavior when subjected to changes of temperature. In tests made with two tubes of the same diameter and thickness, and of exactly the same length at 46 degrees Fahr., one of iron and one of steel, in which they

were heated red hot three times, and cooled by dipping in water until their temperature was reduced again to 46 degrees Fahr., it was found that the total contraction of the steel tube after the third cooling was .05425 inch, and of the iron tube .01300 inch, an excess of contraction of the steel tube of .04125 inch. In another test the ends of two tubes of the same size and thickness, one of iron and one of steel, were inserted into a pair of plates bolted together.

"Each hole was rimered with the same bit and each tube end turned to the same gage and rolled by the same man. The whole was heated in a furnace to a dull red heat, and dropped into water of about 100 deg. Fahr. After the structure was cooled it was found that the steel tube was so slack in the hole that when water was poured upon the joint it ran between the plate and the tube. The iron tube was tight."

While these tests were much more severe than the ordinary conditions of service, it is yet probable that they give a true indication of the behavior of steel tubes when subjected to the rapid changes of temperature they often necessarily undergo in locomotive service.

AN UNTENABLE POSITION.

A manifesto declaring its principles was recently issued by the Advisory Committee of the Homestead strikers, in which the position was taken that workingmen have an "equitable interest" in their employers' property, or that employés have certain ownership rights in the establishments of their employers, and that they have a right to continuous employment without regard to the views and wishes of employers. This explains the actions of these misguided men in their open resistance to the officers of the law, the murder of watchmen sent to guard the premises of their employers, and their declaration that they will never allow non-union men to take and keep the positions from which they have been dismissed.

According to this, then, when citizens of this country have expended millions of dollars in establishing great enterprises, assuming the risks of business, and furnishing the skill and ability of management upon which, absolutely, the success of the enterprise depends, they become no longer the masters of the enterprise when they employ a workman. No matter that the agreed terms of employment are that the workman's compensation shall be a stated sum for work done, that he assumes none of the risks of business, shares none of the losses when they occur, furnishes no skill contributory to the success of the business, except in the performance of the specific work he is hired to perform, he must, because he has been hired, be considered a part owner of the property for all time to come, with a perpetual right to be employed there to the exclusion of everybody else, at such wages as he sees fit to demand, and with the right to drive off or shoot down anyone who may be employed to work in his stead.

While absolutely silly when looked at in this light, this is, in fact, the position declared by the committee's manifesto, and it is the assumption upon which the dismissed workmen of the Carnegie works have acted all along in their lawless behavior since the mills were closed against them.

The declaraction is worse than silly; it is the gospel of anarchy and, coming, as it does, officially from a labor organization, it is disgraceful to trades unionism and will have the effect of arraying public opinion very strongly against the same, unless the principles of the manifesto are vigorously disclaimed by the different branches of organized labor throughout the country.

The addition to rule No. 26, of the Rules of Interchange, providing that "When an M. C. B. coupler is changed in Canada on defect card acknowledging wrong material, couplers may be charged at manufacturers' prices in the United States, plus the customs duties, which must be paid on entering Canada," has excited some adverse criticism among those who probably do not understand the disadvantage the Canadian roads have suffered in the matter for some time.

The fact is that the Canadian roads buy their M. C. B. couplers in the United States and have to pay the customs duty, amounting to fifty per cent. of their cost in the United States, upon the couplers when taken into Canada. In the case of a Canadian car fitted with these expensive couplers coming to the United States, and here through accident of some kind having one or both of its couplers replaced by couplers of wrong material and sent home with a defect card acknowledging the same, the owning road previously could only bill for the cost of the couplers in the United States, yet the repairs must be made with couplers costing it fifty per cent. more. This was not only an injustice but a great discouragement for Canadian roads to use M. C. B. couplers. The change in the rule is eminently fair and just. Those who wish to avoid its provisions can do so by replacing original couplers on Canadian cars by couplers of proper material.

Railroad men can agree with Charles Francis Adams, when he said that the safest place in which to spend an hour or two is on an express train on one of the main railways. Last year only five passengers were killed on all the railways of Great Britain, while on the streets of London alone, 147 deaths and 5,784 injuries resulted from accidents.

It has taken the legal authorities at St. Louis six months to decide that, according to law, it is not a crime to steal electricity. In February last a hardware dealer in that city tapped the wires of an electric light company in order to get illumination for his store free. At the trial the lawyer for the defense interposed the ingenious argument that at common law electricity is unknown, and could not, under the code, be made a subject of larceny, and that no statutory law existed making it a felony or misdemeanor to steal electricity, for the reason that its character was not known, and that it was not subject to asportation. The Judge would not concede that the offense was petit larceny, and the Grand Jury would not allow that it was fraud, so when the case came up recently the defendant was discharged. This is said to be the first case of the kind, but it is not likely to be the last and electric light companies had better look into the matter, and see that their rights are fully established and purloiners of the fluid made to accept the ordinary consequences of their actions.

The suggestion made by the committee of the Master Mechanics' Association on compound locomotives that the starting valves of such engines be made automatic in their action in closing as soon as the start has been effected, is one that should be acted upon by locomotive builders whose starting valves are now made to be opened or closed at the will of the runner. The whole purpose of such a valve is, as the name by which it is known indicates, to admit steam direct from the boiler to the low pressure cylinder to aid in starting heavy trains. Its use after the start is unnecessary and wasteful of fuel; and it should, therefore, be automatically closed when the reverse lever is moved from the full stroke position. Unless this is done it is liable to be neglected, even by well disposed engineers, at times when the coal consumption of the engine is thereby made very extravagant.

The action of the Master Car Builders Convention in providing for the payment of the expenses of the Arbitration and Executive Committees while they are engaged upon the business of the association, is one that will meet with general approval. This is a matter that was neglected, and imposed a burden upon a few roads that should have been shared by all, as the business done by the committees was for the benefit of all.

Books Received.

Smithsonian Report, U. S. National Museum. 1889.

Constitution and By-Laws, and List of Members, of the New England Railroad Club.

A Memorial to Congress. A Comprehensive Exhibit of Roads, their Construction and Maintenance, at the World's Columbian Exposition. By Albert A. Pope.

The Fifth Annual Report of the Interstate Commerce Commission. 1891.

Commerce of Superior and the Sault Canal.

Twelfth Annual Report of the Chicago, Rock Island & Pacific Railway Company.

First Report of the United States Board on Geographic Names. 1890–1891.

Report of the Chief of the Division of Forestry for 1891. By B. E. Fernow.

Transactions of the Canadian Society of Civil Engineers, October to December, 1891.

Report of the Commisioner of Railroads of Michigan, 1891.

The Official Railway List. Edition of 1892. 342 pages. Published by the Railway Purchasing Agent Co. The Rookery, Chicago. Price $2. Sent free to Railroad offices.

This well known publication contains the name and business address of every financial, managing, operating, mechanical, engineering and track officer of every railroad in the United States, Canada and Mexico. Besides the name and address of officers there is also given the gage of the road, miles operated, number of locomotives, and number of passenger, freight and miscellaneous cars used on each road.

The information it contains is invaluable to all who have or wish to establish business relations with any department of any railroad in North America.

On July 18th a mail train on the Welland Division of the Grand Trunk Railway, bound south, and an accommodation train from Niagara Falls, bound north, for the steamer "Empress of India," met in collision a short distance north of Merriton. A short wooden bridge crosses the water-power raceway, and the engine on the boat train had just crossed it when the two trains met. The two first coaches on the boat train were thrown from the track over the bank, plunging into the race stream in which the current is swift. Four trainmen and a number of passengers were killed.

Master Car Builders' Association.

Secretary John W. Cloud has made the following announcements:

AIR BRAKE AND SIGNAL INSTRUCTIONS.

The air brake and Signal Instructions, as approved at the Convention held at Saratoga in June, will be reprinted and bound in a pamphlet form, four inches by six inches, containing thirty-six printed pages, and held for sale by the Secretary, as instructed by the Convention.

The cover and the size will be such as to make this pamphlet readily distinguishable from the Rules of Interchange, besides which there will be printed on the cover the words "Air Brake and Signal Instructions, 1892." There will be no other printing on the cover unless it be ordered and specified. These books will be furnished at the same rates and under the same conditions as the Rules of Interchange, viz.: 25 copies, $1.00; 50 copies, $1.75; 100 copies, $3.00. A less number than 20 copies at five cents per copy. Postage will be added in all cases when sent by mail.

Parties who wish copies of the Air Brake and Signal Instructions should make requisition for the same on this office, and specify additional printing on the cover, if wanted. Shipments of more than fifty copies will be by express, and orders should designate the express company, if one is preferred.

REVISED RULES OF INTERCHANGE.

The rules of interchange, as revised at Saratoga in June, and which are to go into effect on Sept. 1, 1892, will be ready for distribution about July 25, and they will be furnished at the same rates as heretofore, viz.: 25 copies, $1; 50 copies, $1.75; 100 copies, $3.

A less number than 20 copies five cents per copy. Postage will be added in all cases when sent by mail. There will be no printing on the cover except "Revised 1892," unless ordered and specified, in which case the additional printing on the cover will be charged additional at cost.

Parties who wish copies of these revised rules should make requisition for the same on this office, and specify additional printing on the cover, if required. Shipments of more than fifty copies will be by express, and order should designate the express company, if one is preferred.

The address of the secretary is No. 974 Rookery Building, Chicago.

The Secretary has issued letter ballot voting slips calling upon the members to vote upon the proposed change of the term "Flat by sliding," as used in the wheel guarantee, to "Flat or comby by sliding," as recommended by the Committee on Wheel Guarantee in its report to the recent Annual Convention of the Association.

The vote is also called upon the adoption of the coupler gages proposed by the Executive Committee in its announcement of September, 1891, and recommended by the Committee on the M. C. B. Coupler Standards and Limits.

The committee says that these gages will preserve the contour lines, and render it impossible to make any local changes which will prevent the interchange of couplers of the M. C. B. type. The committee has also ascertained that the variation allowed by these gages from the standard lines is sufficient to cause no difficulty in the manufacture of the couplers.

The votes will be counted Aug. 31, 1892, and any votes not received at the Secretary's office before that date will be excluded from the count, as provided by the Constitution.

Master Mechanics' Association.

The following circular has been issued by the Secretary

There will be one scholarship for the four years' course open for competition at the Stevens Institute of Technology next September. The requirements are that the applicants shall be sons of members of the American Railway Master Mechanics' Association, in good standing, and they must have at least one year's experience in a machine shop.

There will also be vacancies for scholars in the second and fourth year classes. Should no candidates pass for these, there will be two scholarships open in the Stevens Preparatory School for persons eligible for the Association Scholarships in the Stevens Institute of Technology. Full particulars can be obtained on application to

ANGUS SINCLAIR, Secretary.

A new line, to be known as the Philadelphia & Cape May, is to be built between Philadelphia and Cape May, a distance of seventy-six miles.

The monthly statements made by the railroads to the Interstate Commerce Commission during the past two years have been discontinued by order of the commission.

It is rumored that the Lake Shore & Michigan Southern Company will establish block signals between Buffalo and Chicago, but the system to be used has not yet been decided upon.

Up to the present time this year the Northern Pacific Company has built but ten miles in the State of Washington, which addition was made on the Yakima & Pacific Coast Branch.

Personal.

Mr. Alex. C. Tremp, Master Mechanic of the Ohio Southern, has resigned.

Mr. G. A. Hancock, General Master Mechanic of the Atlantic & Pacific, has resigned.

Mr. John Blythe has been appointed receiver of the Columbus, Lima & Milwaukee road.

Mr. Herbert Higgins has been appointed Master Mechanic of the Atchison, Topeka & Santa Fe at La Junta, Colo.

Mr. Edwin Parsons has been appointed Purchasing Agent of the New York & New England, with headquarters at Boston.

Mr. J. F. Babbitt, Jr., has been appointed Purchasing Agent of the Central of Georgia, with headquarters at Savannah, Ga.

Mr. Joel West has been appointed Master Mechanic of the Iowa lines of the C., B. & Q., with headquarters at West Burlington, Iowa.

Mr. A. W. Gibbs has retired from the position of Superintendent of Motive Power of the Central of Georgia, and that position has been abolished.

Mr. J. J. Thomas, Jr., has been appointed Master Mechanic of the Birmingham & Atlantic. His headquarters will be at Talladega, Ala.

Mr. Robert W. Baxter has been appointed General Superintendent of the Pacific Division of the Union Pacific, with headquarters at Portland, Ore.

The office of R. D. Wade, Superintendent of Motive Power of the Richmond & Danville, has been moved from Atlanta, Ga., to Washington, D. C.

Mr. J. J. Ellis has been appointed Master Mechanic of the Chicago, St. Paul, Minneapolis & Omaha, to succeed Mr. Matthew Ellis, resigned on account of ill health.

Mr. J. J. Sullivan has been appointed Master Mechanic and Master Car Builder of the Savannah, Americus & Montgomery, with headquarters at Americus, Ga.

Mr. L. M. Butler formerly Master Mechanic of the New York, Providence & Boston, has been appointed Master Mechanic of the New York, New Haven & Hartford.

Mr. D. J. Danell, Mechanical Engineer of the Illinois Central Railroad, has been appointed Mechanical Engineer of the Illinois Steel Company's works at South Chicago.

Mr. John Grace, formerly General Superintendent of the Monterey & Mexican Gulf, has been appointed Superintendent of Motive Power and Construction of the Pavenir De Matehuala road.

Mr. A. W. Gibbs, formerly Superintendent of Motive Power of the Central of Georgia, has been appointed Division Master Mechanic of the Richmond & Danville, with headquarters at Atlanta, Ga.

Mr. George Gilmore has taken charge of the motive power and machinery of the railroads of Jamaica, succeeding Mr. Sague, who lately resigned to go to the Schenectady Locomotive Works as Mechanical Engineer.

Mr. George A. Hancock, who recently resigned as Master Mechanic of the Atlantic & Pacific, has been appointed Superintendent of Machinery of the San Antonio & Aransas Pass, with headquarters at San Antonio, Tex.

Mr. J. Hope Sumner, General Manager of the Zanesville & Ohio River Railroad, was appointed Receiver of the same July 20, on the application of New York bondholders and the Mercantile Trust Company of New York, which holds a mortgage securing the bonds.

The office heretofore filled by Purchasing Agent A. T. Canfield, of the Texas & Pacific, has been abolished. It is understood that Mr. Abram Gould, Purchasing Agent of the Missouri Pacific system, will attend to similar duties in connection with the Texas & Pacific.

Mr. F. A. Stinard, formerly Division Master Mechanic of the New York, Lake Erie & Western, has become connected with Mr. Arthur Pennell, of Kansas City, manufacturer of feed water purifiers, and will represent him in the East, with headquarters at Paterson, N. J.

Mr. Richard English, formerly Division Master Mechanic of the Atchison, Topeka & Santa Fe at San Marcial, N. M., has been appointed General Master Mechanic of the Atlantic & Pacific, with headquarters at Albuquerque, N. M., succeeding Mr. G. A. Hancock, resigned.

Those who attended the convention of the Master Car Builders and Master Mechanics' Associations in June, will long remember with pleasure the courtesies shown them by the management of the Delaware & Hudson Canal Co., through its genial and popular Superintendent of Motive Power, Mr. R. C Blackall.

Mr. W. S. Cox has been appointed Air Brake Inspector and Instructer of the Atlantic system of the Southern Pacific, with headquarters at Houston, Tex. He will have charge of the inspection of air brake equipment and the instruction and examination of all employés whose duties require them to use the air brakes.

Mr. Clarence H. Howard, Assistant General Manager of the St. Charles Car Works, will sever his connection with that company on Aug. 1. Mr. Howard has been elected Secretary of the Safety Car Heating Company, succeeding Mr. Charles Gately, who has resigned. Mr. Howard's headquarters will be in New York City.

Mr. John A. Hall, of Chicago, editor of the *Switchmen's Journal*, was killed at the Relay depot, East St. Louis, June 22, in attempting to board an outgoing train of the Cairo Short Line. The train was already in motion and Mr. Hall grabbed at the railing with one hand, but the momentum was too great, and he fell between the cars and was crushed to death.

Mr. Benjamin Morton, First Vice-President of the Long Island Railroad system, has, in addition, been made General Manager. Mr. Morton has been recognized for some time past as the active head of this road, and is a man of great capacity and judgment. One of the ingenious acts he has performed is the invention of a complete block system now in use on a portion of the line.

The following changes have been made in the mechanical department of the Cleveland, Cincinnati & St. Louis: Mr. O. H. Jackson, Master Mechanic of the Brightwood shops, has resigned, and has been succeeded by Mr. F. M. Lawler, formerly of Mattoon, Ill. Mr. G. A. McKee is made Master Mechanic at Mattoon, and Mr. J. H. Berry is made Master Mechanic of the Cincinnati division.

Work on the Cartagena-Magdalena Railroad, Colombia, is making rapid progress. Ten miles have already been graded and one and a half miles of track have been laid.

The railroad system controlled by the Fall Brook Coal Company has been changed to the Fall Brook Railway Company. The road extends from Lyons, N. Y. to Williamsport, Pa. The President of the company has also issued a circular which states that the company formerly known as the Corning, Cowanesque & Antrim Railway Company will operate the lines of the Syracuse, Geneva & Corning Railroad and the Pine Creek Railway's line, formerly occupied by the Fall Brook route.

A delegation representing the locomotive engineers of the Chicago & Northwestern recently asked the Smoke Inspector of Chicago to withdraw suits brought against the company for alleged violations of the smoke ordinances. They said the company had discharged engineers on account of the suits and that the action was arbitrary in that engines were not supplied with smoke-consuming devices. They were informed that the Inspector could not interfere between the company and its men, and that the suits were brought, as others were, for violations.

On the morning of July 9, a series of explosions occurred at the Giant Powder works, near Oakland, Cal., by which the whole plant was entirely destroyed and five men killed The resultant concussion exceeded in intensity anything of the kind ever experienced in California. The people in San Francisco, Oakland, Berkeley, Saucelito and other cities around the bay were seriously alarmed, the buildings being shaken severely and quantities of glass being shattered. The explosions were also felt at Sacramento, eighty miles off. The loss to the powder company is about $200,000.

Mr. Chauncey M. Depew said, recently, in speaking of the transportation of the great number of people who will visit the Columbian Exposition at Chicago:

There will be no difficulty in transporting the millions who will want to visit the fair from the East with ease and comfort. Nothing that could be added to the equipment of the New York Central's passenger service is being neglected, and the trip from New York to Chicago can be made without difficulty in 24 hours by as many trains as the circumstances may call for. The danger from every known source is being reduced to a minimum. We are abandoning the old system of lighting the cars with kerosene lamps, and more than half the coaches have already been equipped with the most improved and the safest system of lighting known in this country or Europe. With the new lamps there can be no possibility of danger from explosion or otherwise, as the apparatus is all outside of and under the car, and in the event of a mishap, the fixtures become detached and the gas escapes into the air. The cars have been heated for the last three years according to the laws of the State, while the block system for the control of trains is being extended as rapidly as practicable.

The following schedule of allotments of space in square feet to foreign nations in the World's Fair Agricultural Building includes grants of increase made since the first schedule of allotment determined upon some time ago. As finally fixed, these allotments are as follows: Brazil, 7,200; Argentine Republic, 2,976; Chile, 731; Honduras, 999; Nicaragua, 1,180; Colombia, 1,810⅜; Peru, 1,342⅜; San Salvador, 1,342⅜; Bolivia, 1,342⅜; San Domingo, 912; Porto Rico, 912; Cuba, 1,444; Ecuador, 1,710; Guatemala, 978; Hayti, 978; Ceylon, 1,684; Mexico, 6,020; Germany, 11,875; Great Britain, 18,346; France, 6,835½; Denmark, 1,584; Sweden, 1,760; Japan, 3,038.

Economy of Large Boilers.

An instance illustrating the value of a large boiler as an economizer of fuel is given in the following comparison of a year's performance of two freight engines on the Truckee division of the Central Pacific Railway.

Both engines run in regular through freight service on the same piece of road; and from observations made while making a trip on engine 62 it was evident that the economy did not result from superior management or condition of the engine, but that it was fairly due to the larger boiler of the engine.

DIMENSIONS.

	Engine 62 C. P.	Engine 124 C. P.
Maker	Schenectady.	Globe.
Grate area	18 sq. ft	14¾ sq. ft.
Flues	170 ft. 2 in. x 11 ft. 6 in.	133 ft 2 in. x 11 ft. 6 in.
Length of firebox.	72 in., depth, 60 in.	59 in., depth 54 in.
Steam pressure	140 lbs.	130 lbs.
Cylinders	16½ x 24 in.	16 x 24 in.
Driving wheels, di.	4 ft. 6 in.	4 ft. 6 in.

Engine 62 has 37 flues more than the 124, which adds 222 square feet to heating surface of the boiler; this, together with the increased surface of the larger firebox, enables the heat of the fire to be freely communicated to the water in the boiler, while the 3¼ square feet of additional grate surface allows more perfect combustion.

Following are tables showing and comparing the fuel consumption of these two engines for the year ending April 30, 1891:

Month.	Engine.	Cost of fuel.	Mileage.	Fuel cons'd		Miles run per ton.	Cost per mile in cents, fuel.
				Cords wood.	Tons coal.		
May, 1890	62	$367.25	2,634	2½	70¾	37.23	13 94
	124	537.15	2,674	2½	105	25.47	20.09
	Difference.	169.90	40	½	34	12.76	6.15
June, 1890	62	$414.75	$2,674	2½	80	33.32	15.52
	124	492.15	2,452	2½	93	25.54	20.07
	Difference.	77.40	222	½	15¾	7.78	4.55
July, 1890	62	$66.50	408	½	12¾	32.00	16.30
	124	695.38	3,480	3¼	135¼	25.69	19.98
	Difference.	628.88	3,072	1¼	122¾	6.31	3.68
Aug., 1890	62	$148.50	754	¾	30	25.13	19.70
	124	687.90	3,816	3¼	139	27.40	18.03
	Difference,	539.40	3,062	¼	109	2.27	1.67
Sept., 1890	62	$678.00	4,214	3¾	142½	29.58	16.09
	124	752.40	3,932	3½	159	24.72	19.15
	Difference.	74.40	282	¼	16½	4.86	3.06
Oct., 1890	62	$616.45	4,184	3½	129¾	32.25	14.73
	124	943.80	4,576	1¼	200	22.88	20.62
	Difference.	327.35	392	¾	70¼	9.37	5.89
Nov., 1890	62	$502.65	3,394	3¼	110	30.78	14.81
	124	601.15	3,328	2¾	133	24.98	18.06
	Difference.	98.50	66	¼	23	5.80	5.25
Dec., 1890	62	$490.30	3,374	3	108	31.24	14.53
	124	448.00	2,658	2½	98¾	26.93	16.85
	Difference.	42.30	716	½	9¼	4.31	2.32
Jan, 1891	62	$439.17	2,976	2¾	96½	30.84	14.76
	124	488.68	3,026	2¾	107	28.08	16.14
	Difference.	49.51	50	....	10½	2.76	1.38
Feb., 1891	62	$319.93	2,372	2¼	70	33.89	13.49
	124	411.00	2,316	2	91	25.43	17.74
	Difference.	91.07	56	¼	21	8.44	4.25
March, 1891.	62	$466.45	3,112	2½	103	30.21	14.99
	124	175.80	1,002	1	38	25.86	17.54
	Difference.	290.65	2,110	1½	65	4.35	2.55
April, 1891	62	$541.47	3,162	2¾	119	26.41	17.12
	124	553.35	2,930	2½	122	23.87	18.89
	Difference.	11.88	232	¼	3	2.54	1.77
Summary	62	$5,051.42	33,258	33¾	1,059	31.07	15.49
	124	6,786.76	38,190	32¼	1,424	25.57	18.43
	Difference.	1,735.34	2,932	½	365	5.50	2.94

Supposing both engines had run the same number of miles during the year (average miles run, 34,724 × 2.94 cts. =) $1,020.88 represents the economy of engine 62.

Under the disadvantage of running 2,932 miles less than engine 124 in the year's service, engine 62 yet effected an actual economy of (33,258 × 2.94 =) $977.78.

The generators that George Westinghouse is building to furnish electricity for the 93,000 incandescent lamps at the World's Fair are to be the largest in the world. One of them will operate 20,000 lamps.

A little pamphlet called "A Fast Ride to Richfield Springs on the Empire State Express," has been issued by the passenger department of the New York Central. Its purpose is to give a general idea of what quick traveling is.

The steamship "Naronic," the new White Star Line freighter, which arrived in New York from Liverpool recently, made the fastest maiden trip ever made by a freight boat. She came from Liverpool in nine days and four hours.

It is reported that the Housatonic Railroad system and its leased line, the Danbury & Norfolk road, is to be placed in the hands of a receiver as the most practical way of bringing their affairs into a satisfactory condition and securing thorough reorganization.

A schooner bound for Philadelphia from New York was sunk recently three miles off Sandy Hook by a 500-pound projectile fired from a 10-inch gun at the United States proving grounds at Sandy Hook. The captain and crew of the schooner were rescued by a steam launch. The officer who was in charge of the gun says the vessel was out of the range of the gun, but that the projectile was probably deflected by striking a sand dune.

Communications.

The Recent Collision on the Pennsylvania Railroad.

Editor National Car and Locomotive Builder:

No amount of skill or foresight can always prevent accidents on railroads. The Pennsylvania Central is considered one of the best managed roads in the country. Notwithstanding that fact, what a terrible calamity was the last accident on that road.

What shall be done to avoid accidents and render those that do occur as harmless as possible? The answer is:

Make cars of steel that will not break or burn.

As a precedent to these remarks it can be stated that there were built two passenger cars of iron. One ran at full speed in the open drawbridge at Hackensack; the shock was heard, as can be shown by the reports, two miles away, and yet the car was not broken, and the passengers, 22 in number, were not injured. Another car built on the same plan in a collision on the Eastern road in Boston ran 20 feet into a passenger car without itself being damaged except a little in one platform.

These cars being made of iron were not as strong relatively speaking as they can now be made with steel and with recent improvements.

There are no rational objections against steel cars properly constructed, but on the contrary *everything* can be said in their favor as can be demonstrated.

It may be argued that it is next to impossible to make cars that will not break or give way in collision. That is very true. But the main object should be to protect the passengers from injury at such times. In a future number I will enter into the details by which this may be accomplished.

B. J. LA MOTHE.

"Railway Car Construction."

(*From the Railway World.*)

We have received from the publisher, Mr. R. M. Van Arsdale, a copy of "Railway Car Construction," by William Voss. The book originally appeared as a series of articles in the columns of the NATIONAL CAR AND LOCOMOTIVE BUILDER. In permanent form they make a solid and attractive looking volume. The chapters of the book bear the following tittles: "Freight Car Bodies; Draw Bars and their Attachments; Floors and Framing; Sheathing and Roofs; Doors; Stock Car Bodies; Platform or Flat Cars; Coal, Ore and Refrigerator Cars; Freight Car Trucks; Trucks Frames; Swing Motion Trucks; Freight Car Trucks (continued); Freight Car Brakes; Power Brakes; Passenger Cars; Dimensions and Floor Frames; Platforms and Couplers; Passenger Car Trucks; Pullman's Palace Cars; Wagner's Palace Cars; Pennsylvania Railroad's Standard Passenger Cars; Pennsylvania Railroad Standard Passenger Car Truck; Standard Passenger Car, New York Central & Hudson River Railroad, and Boston & Albany Railroad's Standard Passenger Car. The appendices are as follows: Standards Adopted by the Master Car Builders' and Master Mechanics' Association; Code of Rules Governing the Condition of and Repairs to Freight Cars.

While the lack of space forbids quotation, it must at least be said that this book is a valuable addition to the technical literature of the railway system.

The total number of passengers killed in railroad accidents in Great Britain in 1890 was five and of employés 12, the injured numbering 875 passengers and 154 train hands. Apart from the train accidents there were 66 killed at highway crossings, 393 trespassers and 57 from miscellaneous causes.

Chicago Elevated Railroad Cars.

The accompanying illustrations show the interior and exterior of one of the cars used on the elevated railroad in Chicago. As will be seen from the engravings the general appearance and interior arrangement are similar to the cars on the elevated railroad in New York City. However, they differ in some details, principally in having double end-doors which give much freer entrance and exit to passengers. This is very important and aids materially in shortening the length of time of the necessary stops at stations. These double doors are operated by the movement of one handle. The general finish of the cars is of light mahogany, the window shades are of white wood

and all the interior decorations of a light color. The cars are illuminated by the Pintsch gas system, and equipped with the Westinghouse automatic air brake and Gold car heating system.

Great attention has been given all details of these cars in order to have the whole construction as durable as possible, and afford as much comfort to the patrons of the road as

To prevent efflorescence on brick work or remove it when it occurs, a writer in *The Builder* recommends either weak hydrochloric acid or a solution of common salt. The latter he claims to have used with much success, either dipping the bricks into the brine before laying, or thoroughly washing the face of the wall with it after completion.

could be secured. They have Vauclain wrought iron wheels made by the Standard Steel Works. Following are the general dimensions:

Length of car over all	45 ft. 11 in
Extreme width	8 " 6 "
Height from bottom of sill to top of roof	9 " 6 "
Width of double-door openings	3 " 6 "
Distance, center to center of trucks	32 " 6½ "
Center of truck to end of platform	6 " 9¾ "
Weight of car empty, about	28,000 lbs.

Car Works Consolidated.

The Michigan Peninsular Car Company, with a capital of $8,000,000, exclusive of $2,000,000 first mortgage bonds, has been formed by consolidating the Michigan Car Company, the Peninsular Car Company, the Detroit Car Wheel Works, the Michigan Forge and Iron Company and the Detroit Pipe and Foundry Company. The business dates from 1864 for the Michigan Car Company and from 1879 for the Peninsular Car Company.

The consolidation brings into life a freight car manufacturing combination on a par with the Pullman's Palace Car Company in the way of passenger and freight car building. The several companies have been employing about 5,000 men. The property owned covers about 81 acres of ground in Detroit, with buildings 78 in number. The working plant and real estate are valued at nearly $6,000,000. The capacity of the combined companies approaches 100 cars a day.

Two facts mentioned by Mr. Valon, in his presidential address to the Incorporated Gas Institute of England, bring out the undesirability of bituminous coal for combustion in cities. By an ingenious apparatus lately invented, it has been shown that in Glasgow, on a wet morning, there are 7,500,000 dust particles in a cubic inch of air. It is calculated that in London nearly 100,000 tons of sulphur are produced annually by coal consumption and thrown into the air.

Proposed Coupler and Brake Law.

A synopsis of a bill favorably reported to Congress in June requiring the equipment of all locomotives with power brakes after July, 1895, and all cars after July, 1898, was published in the July issue of the National Car and Locomotive Builder. Since then the bill has passed Congress and is now before the Senate with a strong probability of passing. With the well understood attitude of the President toward such legislation it is quite probable that this bill, possibly with some modifications, may become a law, and we therefore print it herewith in full:

Sec. 1. On and after July 1, 1893, it shall be unlawful for any common carrier engaged in interstate commerce by railroad to put into use on its line any new locomotive to be used in moving interstate traffic that is not equipped with power driving wheel brakes.

Sec. 2. That from and after July 1, 1895, it shall be unlawful for any such common carrier to use on its line any locomotive engine in moving interstate traffic that is not equipped with a power driving-wheel brake so arranged as to be operated in connection with the train brake system.

Sec. 3. That on and after July 1, 1895, it shall be unlawful for any such common carrier to use on its line for the purpose of moving inserstate traffic any new car or any old car that has been to the shops for general repairs to one or both of its drawbars that is not equipped with automatic couplers of the standard designated under and in accordance with the provisions of this act.

Sec. 4. That on and after July 1, 1898, it shall be unlawful for any such common carrier to haul or permit to be hauled or used on its line any car used in moving interstate traffic unless such car is equipped with automatic couplers of the standard designated under and in accordance with the provisions of this act.

Sec. 5. That on and after July 1, 1895, no such common carrier shall put into use or haul or permit to be hauled on its line for the transportation of interstate freight or traffic any new car belonging or leased to it or any old car belonging or leased to it which subsequently to the passage of this act has been sent to its shops for general repairs, unless such car is equipped with brakes for each wheel and with train-brake apparatus of such a nature that the brakes can be set and released from the locomotive.

Sec. 6. That on and after July 1, 1898, no such common carrier shall haul or permit to be hauled on its line for the transportation of interstate freight traffic any car which is not equipped with brakes for each wheel and with a train-brake apparatus of such a nature that the brakes can be set and released from the locomotive.

Sec. 7. That on or before July 1, 1893, every such common carrier shall file with the Interstate Commerce Commission in Washington a statement certified to under oath by the president and clerk of the corporation, as the action of said corporation through its board of directors, setting forth such details with reference to the height, form, size and mechanism of freight car couplers as it deems essential in order to insure requisite uniformity, requisite automatic action, and requisite safety in service, and also stating the number of freight cars owned by it and under its control, and also the number of other cars under its control by lease on June 30, 1892, exclusive of those used solely for state traffic. Such statements shall be made upon blanks to be provided by the Interstate Commerce Commission and the determination of such commission in relation to the validity of the several statements received shall be final. If upon examining the statements so received said Interstate Commerce Commission is of opinion that companies owning at least 75 per cent. of the freight cars owned and controlled as aforesaid by companies which shall have duly filed statements as aforesaid have agreed upon such details of freight car couplers as will insure requisite uniformity, requisite automatic action, and requisite safety in service, said Commission shall thereupon declare and publish that couplers complying with such details so agreed upon shall thereafter, until otherwise ordered according to law, be the standard couplers for use in the freight car interstate service. If the common carriers shall fail to establish a standard coupler as herein provided, then the standard automatic coupler shall be such coupler as shall be selected by the Interstate Commerce Commission, and it is hereby made the duty of said Commission within six months after July 1, 1893, to select and designate some automatic coupler as a "standard type," under the provisions of this act, and to promulgate notice of such selection.

Sec. 8. That after July 1, 1898, any such common carrier may refuse to accept or receive any car used in interstate commerce that is not properly equipped, as required by this act, and the carrier loading or starting such car shall be liable for the damages, if any result therefrom.

Sec. 9. That from and after July 1, 1893, until otherwise ordered by the Interstate Commerce Commission, it shall be unlawful for any railroad company to use any car in interstate commerce that is not provided with secure handholds in the ends and sides of each car.

Sec. 10. That within ninety days from the passage of this act the American Railway Association is authorized hereby to designate to the Interstate Commerce Commission the standard height of drawbars for freight cars, measured perpendicular from the level of the tops of the rails to the centres of the drawbars, and shall fix a maximum variation to be allowed between the drawbars of empty and loaded cars. Upon their determination being certified to the Interstate Commerce Commission, the Commission shall give notice of the standard fixed upon, at once, to all common carriers, owners, or lessees engaged in interstate commerce in the United States by such means as the Commission may deem proper, and hereafter all cars built or repaired shall be of that standard. But should said association fail to determine a standard as above provided, it shall be the duty of the Interstate Commission to do so. And after July 1, 1893, no cars shall be used in the interstate traffic which do not comply with the standard above provided for either loaded or unloaded.

Sec. 11. That any employé of any such common carrier who may be injured by any locomotive car or train in use contrary to the provisions of this act, shall not be deemed guilty of contributory negligence, although continuing in the employ of such carrier after habitual unlawful use of such locomotive, car or train had been brought to his knowledge.

Sec. 12. That any such common carrier violating any of the provisions of this act shall be liable to a penalty of $100 for each and every such violation, to be recovered in a suit or suits to be brought in the district court of the United States having jurisdiction in the locality where such violation shall have been committed, by the United States District Attorney of such district, and it shall be the duty of such district attorney to bring such suits upon duly verified information being lodged with him of such violation having occurred. And it shall also be the duty of the Interstate Commerce Commission to lodge with the proper district attorneys information of any such violations as may come to its knowledge.

Blue Paper Printing.

The process of making blue prints is a valuable and important part of the knowledge that a draftsman must possess, and the process is so simple that the method should be put to much greater use than at present, even though it be used a good deal for the production of working drawings for shop use, and for the duplication of specifications, details, contracts, etc. The blue printing process is capable of being carried much further toward perfection than as practiced at present, when its use is chiefly limited to the production of copies of drawings which show white lines on a blue ground. Such drawings are tiresome to the eye, and do not impress the workman as favorably as blue or black lines on a white ground.

The usual process of making blue prints is to coat one side of the paper, using for the purpose a brush or a sponge, with a mixture consisting of one drachm of the red prussiate, and one and one-half drachms of the ammonia citrate of iron, dissolved in about one ounce of water. This amount of solution will be sufficient to coat several large sheets of paper, but it will not keep a great while after being coated. The surface is yellow when first coated, and after a week or so will have turned to a dirty greenish color. It can be used in this condition, but makes inferior prints. It is better to make up some fresh solution, for it only takes a few minutes to dry the paper ready for use after the coating has been spread on. Then a sheet of it is put under the tracing, and exposed to sunlight under a sheet of thick glass, or in a regular frame for making blue prints. After exposing until the parts of the paper not protected from the sunlight have turned to a kind of "greenish granite" color, the print is removed and washed in clear water until the yellow color stops coming from it. Then the print is hung up to dry.

In order to make a blue print with blue lines on a white ground two methods are open. The first is to make a print which may be called a "negative," and then to make the blue line prints from that instead of from the drawing itself. The reader can readily see that if a print from a transparent sheet, with opaque lines thereon, will give a copy that is opaque with transparent lines, then by taking another print from the first print there will be opaque lines on a transparent ground again, similar to the original drawing. But there is one drawback to this method which is fatal to its success. That is, the blue print which is made from the original will not work when used as a negative, because being of a blue color the rays of light which shine through the color will affect the sensitive sheet fully as quickly as the rays which shine through the transparent or white paper. In fact, blue is one of the actinic colors and likewise one of the most actively actinic of them all. Now, if the print taken for a negative could be black, yellow, red or any of the non-actintic colors, there would be no more trouble in printing a blue print from it than there is in printing one from the original tracing.

It is in order, therefore, to look around for some means of making a print which will be non-actinic. To this end, it is best to get a sheet of "silver paper" from a photographer, or, what is easier, get him to make a print of the tracing on silver paper. Then, after that is "toned" and finished, it can be used as a negative for the making of as many blue-line prints as may be desired.

The other way of making a blue line print, or, in fact, one other way, is to make up a kind of blue print paper which will turn blue only where the sunlight does not hit it. This is a little different from the first kind of paper described, and the difference is that this kind is charged with chemicals which the sunlight has the power of destroying the color thereof, instead of setting the color, as in the case of the ordinary blue paper already described.

For the present it will be sufficient to state that the paper is prepared by mixing together three solutions, then mixing the three into one when ready for use, and spreading it on the paper as if for a simple blue print. The three solutions are as follows: Gum arabic, 6 drachms; water, 30 drahms. Ammonia citrate of iron, 4 drachms; water, 8 drachms. Perchloride of iron, 2.5 drachms; water, 5 drachms.

As these things will keep separate, they can be mixed in larger quantities; for instance, taking ounces for drachms, then the quantity that is to be used at one time can be taken of each, let it be in drachms, half drachms or minims. The paper will also keep well after it is sensitized, so that a quantity may be made up at one time and kept from the light till needed. The reason that this kind of paper will keep, while the other will not, is because the common paper turns upon exposure to the light, while this kind will not turn, even in the developing solution, if it is exposed to the light. The paper is printed in the usual manner, then it is floated upside down on a solution of potassium ferrocyanide, one ounce; water, four ounces.

The paper must be floated on top of the mixture because it will stain the back of the print if any of it gets thereon. After the lines get blue enough, as may be determined by turning up a corner of the paper occasionally, it should be removed from the "developer" and floated on clean water, which will at once stop the process of turning any darker. If there be any blue spots left on the paper where they don't belong, *i. e.*, except on the lines, they can all be cleared off by putting the sheet of paper in (no need to bother with putting on top this time) a solution of eight parts muriatic, three parts, sulphuric acid, with 100 parts of water. After the blue spots have disappeared, wash well in water, dry, and a print with rich blue lines on a white ground is the result. This kind of a print, the "blue positive" may be colored, something which cannot be done with an ordinary blue print.—*The Tradesman.*

A Mechanic's Dream.

There was once a mechanic at Bristol who had a queer dream. Watts was his name, and by trade he was a shot-maker. The making of the little leaden pellets was then a slow, laborious, and, consequently, costly process. Watts had to take great bars of lead and pound them out into sheets of a thickness about equal to the diameter of the shot he desired to make. Then he cut the sheets into little cubes, which he placed in a revolving barrel or box and rolled until the edges wore off from the constant friction, and the little cubes became spheroids. Watts had often racked his brain trying to devise a better scheme, but in vain. Finally, after an evening spent with some jolly companions at the ale house, he went home and turned into bed. He soon fell into a deep slumber, but the liquor evidently did not agree with him, for he had a bad dream. He thought he was out again with the "boys." They were all trying to find their way home when it began to rain shot. Beautiful globules of lead, polished and shining, fell in a torrent, and compelled him and his bibulous companions to draw their heavy limbs to a place of shelter. In the morning when Watts arose, he remembered the dream. He thought about it all day, and wondered what shape molten lead would take in falling a distance through the air. At last, he could rest no longer; he carried a ladleful of the hot metal up into the steeple of the church of St. Mary of Radcliffe and dropped it into the moat below Descending, he took from the bottom of the shallow pool several handfuls of perfect shot far superior to any he had ever seen. Watts' fortune was made, for he had conceived the idea of the shot-tower.—*Mechanical News.*

The Postmaster General has received notice that the South African Republic, known as the Transvaal, has joined the Universal Postal Union. This act reduces the rate of postage on letters to the Transvaal from ten cents per half ounce to five cents per half ounce, and on all other matter from two cents to one cent for two ounces.

Since agitation was begun some ten or twelve months ago to prevent cruelty to animals at sea, the deaths among cattle at sea have been reduced from 16 to 1 per cent. on $25,000,000 worth exported annually, a saving of $3,750,000 worth of cattle yearly. Cattle are only a small item in the valuation of animals transported across the ocean for export or import. The best breeds of horses and sheep are imported here from Europe, and we send abroad annually large numbers of animals of these types. Careful computations by statisticians have shown that by reason of neglect, carelessness and cruelty on shipboard fully $7,500,000 and possibly $10,000,000 worth of stock has been lost annually at sea for a considerable period of time.

An amusing story is told of President Roberts, of the Pennsylvania Railroad, who is a great stickler for discipline. Some time ago, while on his way to Harrisburg, the conductor of the train bowed as he passed without asking to see his ticket. On coming through the train again Mr. Roberts touched his arm and said: "Why did you not ask for my ticket?"

Rather abashed, the conductor replied that he presumed he had his pass.

"Do you know who I am?" next asked Mr. Roberts.

"Yes, sir," replied the conductor, "you are the president of the road."

"Granted that I am. It is your duty to allow nobody to ride over this road without showing a ticket. Always bear that in mind."

The conductor promised to do so in the future, and passed on. After the next station had been passed he again came through the train for tickets, and coming to Mr. Roberts, stopped and demanded to see his ticket.

"That's right, my man," said the president, putting his hand in his breast pocket. Then he grew red in the face, and, as he felt in pocket after pocket, his face became redder. He had left his pass at home. The conductor never moved a muscle of his face, but stood waiting for the ticket. Mr. Roberts was too proud to back out, and finally asked in a meek voice: "How much is the fare to Harrisburg?" On being informed he paid over the money, which the conductor took without a smile, giving him a rebate check good for 10 cents. The president continued his ride in silence.

Western Railway Club.

The regular monthly meeting of the Western Railway Club was held at its rooms, Rookery Building, Chicago, on May 17. Mr. W. H. Lewis read a paper on "The Design and Correct Proportions for Locomotive Smokestacks and Exhaust Nozzles," an abstract of which is given on another page. An informal discussion of the paper followed. Mr. E. M. Herr read a paper on "The Uneven Wear of Tires," in which the conclusions arrived at were :

1. The weight of reciprocating parts and consequently the overbalance in the driving wheels should be as light as possible. 2. As small a proportion of the reciprocating parts should be balanced as is consistent with smooth-working machinery and good riding qualities. 3. Have a careful man at the throttle.

Methods of cleaning passenger cars were discussed informally. The following is an abstract of the discussion :

Mr. Barr : The matter of coach cleaning is something to which I have not devoted any special attention lately, but I did so at one time. The subject involves the cleaning of both the outside and inside. I presume that in mentioning coach cleaning the first thought is given to the outside. I attempted at one time to establish a kind of schedule for coach cleaning ; that is, to define the work necessary for trips and of a certain period of time, in order to form an idea as to the number of men that ought to be necessary to do the work. We got some figures in that respect, but nothing that was very definite.

For cleaning the exterior of the coach we use a mild soap in an almost liquid form. The quality of the soap used has a very decided influence on the durability of the paint. At one time we took a gang of men who were accustomed to wash cars for painting, placed them in one of the coach yards, and the coaches received a thorough cleaning and scraping down, just as if they were to be repainted or revarnished. At first that worked very well ; the cars looked nice for a time; but that severe scraping made the paint deteriorate more rapidly than with the ordinary washing down that a car gets. The varnish and paint are very often blamed, when, if we investigated closely enough, we would find that it was the soap or the handiwork of the men engaged in washing that produced the bad results. Some varnishes will stand washing and the use of soap much better than others. I do not know what causes the difference, but there certainly is a great difference in that respect. I am satisfied that our washing, as it is done at a great many points, is of such an inferior and ill-judged character that it goes very far toward lessening the life of the paint. I am not able to give you our formula for the soft soap used by us for car washing, but it is simply a very mild soap.

Some companies, and especially companies running cars like sleepers, where there is a great deal of elaborate decoration to take care of in the inside of the car, use what is known as wood polish for cleaning the interior. I have investigated some of those wood polishes and find that the principal component is not a polish at all, but is an alkali that takes the dirt off readily.

Mr. Lewis : I think that the prevailing practice in coach cleaning is one of the crudest things that we have on a railroad. A man takes an old brush, dips it in a bucket of water and goes over the side of the car. There is nothing in it that will remove the smoke or oil that collects on the car. It simply removes the dust, and if you use anything in the shape of soap that is strong enough to cut the greese, it is apt, as Mr. Barr says, to injure the varnish. You perhaps have seem some mention made of the use of oxalic acid on our road for outside cleaning. We made some experiments with that, beginning about a year and a half year ago. I first thought that it would injure the varnish, and to test the matter we made two panels and varnished them, and washed them almost daily, one with water and the other with the oxalic acid solution. This was continued all through the summer, and the panels exposed to the weather and the sun, and at the end of the experiment we found that the panel that had been washed with the oxalic acid was in better condition than the one which had been washed with water. The only difficulty that I find in the use of oxalic acid arises from the carelessness of the men using it. If it is not washed off before it dries it will leave the work a little streaked, but if the men work quickly and wash it off with water it will remove all the dirt and give the car a very presentable appearance.

Mr. Files : The practice on our road is to use water and Ivory soap.

Mr. Townsend : If we put any kind of a laborer that we can pick up at $1.25 a day to clean coaches, we cannot expect satisfactory results. On some roads the cleaning is easier than on others. Now the Chicago & Alton cars go through the tunnel at East St. Louis, and when they come out of it they are covered with a sweat containing much dirt and smoke. We can't wash that off without pumice stone and soap, and when those materials are used we must take in the car and varnish it. It takes a better class of help to wash a car and clean it thoroughly than most people are aware of. This ordinary washing of a car with cold water won't take the grease off ; you must use soap, and a great many of the men are not particular enough to do it.

"Railway Car Construction."

(From the Tradesman.)

"Railway Car Construction," by William Voss, published by R. M. Van Arsdale, Morse Building, New York City. This is a valuable work on the practical construction of rarlway cars, giving in detail, with illustrations and scale drawings, the different varieties of American cars now built. It also presents drawings of all the standards adopted by the Master Car Builders' and Master Mechanics' Association. The book is well printed, on heavy paper, substantially bound, and will prove very valuable for reference as well as for practical information to all interested in the subject treated.

The main line of the Cordoba & Northwestern Railway, Argentine, has been inspected and approved by the government officials and has been opened to traffic. The length of this line is 153 kilometers.

New England Railroad Reminiscences of Fifty Years Ago.*

The railroad system in its inception was not only a novelty, but in the eyes of three-fourths of the people a chimera, and the storm of unbelief which years later was raised when Morse proposed his electric telegraph was as a summer breeze to it. The public meetings held to advocate it at times almost reached the point of a riot. At this distance of time it will hardly be credited that a large portion of the merchants of Boston opposed it, and that in the suburbs of Boston men of wealth owning fine estates actually armed themselves and their servants to oppose passage through their land, one Englishman on the line of the Boston & Worcester survey presenting two brass field pieces loaded to the muzzle with grape and canister.

There were a few men who had almost correct visions of the future, but their visions were limited. It was true that the first objective point of the Boston & Worcester railroad was to reach the Hudson River at Albany in order to meet the Erie Canal and receive water-borne freight from that point to New York and thus make Boston the chief port for export on the Atlantic seaboard. At every stage of the building of the road from Boston to Worcester grave doubts assailed them. The widest limit for accommodation on this 44 miles was 4 passenger coaches and 20 freight cars, and this for 10 years.

At that period the opinion generally prevailed that civil engineering as a practical science pertained principally to West Point and other military training schools, and though our early railroads drew largely from these sources it was not many years before they were left sadly in the lurch. Our first superintendents were selected mainly for what was supposed to be their engineering knowledge or for their family and social connection.

The conductors were largely selected from the local stage proprietors and drivers, partly as a compensation for the surrender of their business and calling, but more generally for their peculiar fitness and their personal popularity.

The brakemen, the train baggagemasters, the local baggagemasters and the early freight agents or masters of transportation were largely selected from the drivers of baggage wagons, stable keepers and that class. The locomotive engineers were taken from the best skilled mechanics of the period, the use of steam in other directions being limited. The roundhouse and the machine shop, however, soon became training schools of a high order, and the appentice and the fireman were at once placed in the line of practical education and advancement. The track layers and the section hands were of course new to the business, unless the work on the old corduroy roads. bridge building, graded stone work and grading of the road could be regarded as preliminary teaching. These were the men who laid the foundation and who widened and extended the system, who opened up and utilized newer and larger fields ; who brought an untried experiment up to the standard of a great science.

They were the working force, physically and intellectually, who utilized the wealth and capital of communities and nations and made that capital and wealth of practical benefit to civilized humanity, and to them, without regard to their previous rank and station, from the professional civil engineer to the switchmen and driver of spikes, faithful history will award the credit and the honor.

Now mark the advance in the order named : Our pioneer engineers became presidents and contractors, and were honored with lucrative positions in many of the European countries. Superintendents became presidents and bankers, and were among the foremost to develop the great West. Conductors became superintendents, and for at least during the first ten years the demand for this kind of railroad talent to supply the needs of other New England and Western States was excessive. Some conductors, in their way, became capitalists at the expense of the corporation, upon a plan which would now be called upon State or Wall Street good financiering; but it must be remembered that the temptation to dishonesty then was great and the opportunity greater. The same thing is done to-day, but the system of book keeping is different. Locomotive engineers and firemen reached the top of the ladder. Your traditions tell you that even firemen have arrived at the highest possible distinction, while it is only necessary to look at the history of such men as Sidney Dillon, John Duff, Edward Larned and Norman C. Munson to show what undercontractors have accomplished.

I have but time to give a single illustration of what possibilities were in the earlier days of our Massachusetts railroads. It came direct from the lips of Samuel M. Felton, the first Superintendent of the Fitchburg Railroad.

"One day at the noon hour I was passing through the machine shops of the Fitchburg Railroad, when I overheard the following conversation between two apprentices, who were eating their modest lunch. Their wages were liberal, 37½ cents a day, and free transportation to and from Waltham. One remarked, 'I shall be perfectly satisfied if I ever get to be Master Mechanic.' The other replied, 'So shall I.' Within twenty years both had risen through the several grades up to Master Mechanic, from Master Mechanic to Superintendent and General Superintendent. These two young men were John Adams and Hiram Brittain."

Felton delighted in repeating this as proving the kind of material out of which first-class railroad men are made. In this race for preferment, wealth, blood, position and influence have no show alongside of the trained and practical man, who can tell at a glance when things are right or wrong in any branch or department of the service. These trained men and the interlopers soon find their level, and the latter have to vacate the field, unless they are willing to go back to the first rudiments and soil their hands in obtaining practical knowledge. The railroad system of to-day is replete with such examples.

The clerical force of a railroad office fifty years ago, numerically speaking, was hardly up to the standard of a first class retail dry goods store now; to-day an acre of flooring hardly suffices for the general office needs of a great trunk line, to say nothing of the uptown and downtown offices. There were no modern conveniences then; the teamster and the stage driver were then the freight and passenger agents of the company; their seats were their offices, their pockets their banks of deposit, and a memorandum book the extent of their system of book-keeping.

The locomotive engineers of the Boston & Worcester were of a stalwart race and true blue to a man. In very truth it was a brotherhood, not in the modern sense or application of the word. One of them was a mental as well as physical giant, Dan McClaren, whose career was in many respects more remarkable than that of any of the earlier graduates of the Boston & Worcester. First master mechanic, then surerintendent, then president of the C., H. & D. in the days of its greatest wealth and prosperity.

Memory brings distinctly before me the old hook-motion in inside connection engines. Their titles were typical of the conquest and control which the fathers of the Boston & Worcester contemplated. There was music and poetry in their names, and a mythic refrain in repeating them that was the essence of harmony. Listen: Ajax, Hercules, Vulcan, Jupiter, Mars, Mercury, Venus, Neptune, Ætna, Vesuvius, Hecla, Lion and Leopold, Panther and Tiger, Elephant and Camel, Buffalo and Bison, Comet, Rocket and Meteor. They were great in their day; they fought a good fight; they made the old 36-pound chair rail rattle and shiver. How proud the firemen were of them, and made their brass work shine like burnished gold. Alas! for the good old times. A Webster's Unabridged would hardly furnish names enough for the machines of one corporation now. They are numbered like convicts in the penitentiary.

*Abstract from paper read at the May meeting of the New England Railroad Club by Col. Frank H. Forbes.

The Pennsylvania Railroad Company is to proceed at once with additions and alterations to Broad Street Station, Philadelphia, which will make it the largest terminal depot in this country, if not in the world. There will be a ten-story building erected at the corner of Broad and Market streets, 200 feet high, running 50 feet west of Fifteenth street. The total dimensions of the depot, when completed, will be 306 by 212 feet. The trainshed will be the largest known, 598 feet 8½ inches long and with a span of 304 feet. It is expected that all the additions and alterations will be made before the opening of the World's Fair.

The British consul at Jerusalem, in his last report, refers to the progress of the Palestine Railway, which has now been in course of construction for the last two years. A little over one-half of the line has now been constructed, and there is a prospect that the remainder will be completed in September or October next. The line from Jaffa to the foot of the mountains is in a fairly good condition, but it has not yet been opened to traffic. The part to be finished is that which lies between Jaffa plain and Jerusalem, and which will follow one of the valleys leading up toward Jerusalem from the southwest. The work will be difficult, but it offers no insurmountable obstacles. The length of the whole line will be 54 miles, or 17 miles longer than the present carriage road. When the line is completed a branch will be made from Ramleh to Gaza, possibly with the object of forming a junction with a line from Egypt.

President E. T. Jeffery, of the Denver & Rio Grande, in a recent address said : I like to dwell upon the achievements of this nineteenth century of ours; this period of mechanical miracles performed and perplexing problems solved; this era of the steam engine, the printing press, the steamship, the locomotive, the telegraph, the cotton gin and the factory; this age in which inventors and mechanics have designed and constructed the appliances for conducting the commerce of the world. The steamship, the railway and the telegraph have bound our states together in a common interest, have made their union indissoluble and the principles and institutions of our republican government stable and lasting. They have riveted the chains of commerce around all nations and in all climes. The nineteenth century is the age of iron and steel, of labor and invention, of trade and commerce, of agricultural and industrial development, of education and discovery, of enlightened thought, of broader liberty and of greater general happiness to mankind. In accomplishing these things our people have been the chief actors; from these things our country has been the principal beneficiary, and we all share in her prosperity and in her greatness.

The Design of Locomotive Smokestack and Exhaust Nozzles.*

It is quite natural for the fireman to govern the quantity of coal thrown into the furnace by the variation in steam pressure, and he is not always sufficiently careful to observe whether the box already contains more coal than is required for perfect combustion.

Aside from the wasteful feature in this case, the effect is to entirely change the condition of the draft by raising the vacuum in the smokebox. While an engine with a light fire and free admission of air through the grate bars would ordinarily develop a vacuum of 3 or 4 inches, it will, with a fire that is sufficiently heavy to obstruct this free admission of air, under conditions of draft otherwise the same, produce a vacuum of 15 inches or even higher, the effect of which is to lift the fire from the grate bars where it is lightest, leaving the heavier portions of the fire unsupplied with sufficient oxygen to produce perfect combustion. This increased draft upon the fire draws a great quantity of partially consumed coal through the flues. Now, while it is not possible in all cases to regulate and correct this bad judgment of the firemen, it has often occurred to me that

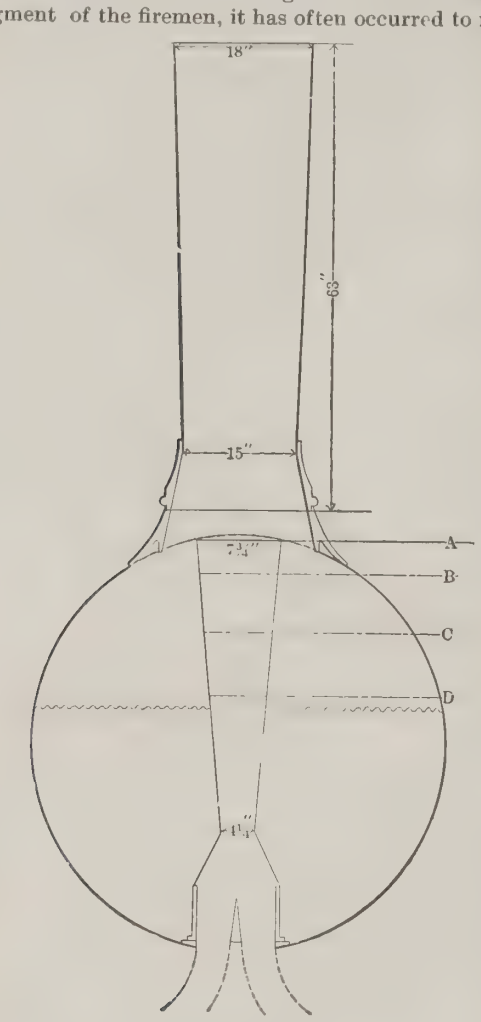


FIG. 1.

this increased vacuum could be utilized to automatically control a mechanical attachment to an expansion nozzle, or Luttgen's smokestack damper, both of which devices have merit, if used properly.

To further illustrate the difficulty in establishing uniform standard of sizes and arrangement of smokestack and exhaust pipes, I wish to call your attention to the variation in the volume and action of the steam in its passage through the cylinders and exhaust pipes, and will take for illustration an engine with 18 × 24-inch cylinders and 6-foot driving wheels. This engine when working at 10 inches cut-off (a point where it would probably develop its greatest power and speed) would pass through its cylinders at each revolution 10,178.4 cubic inches of steam. Let us imagine that this engine has attained a speed of 60 miles per hour, or 280 revolutions per minute, and we have a volume of 2,849,952 cubic inches of steam each minute. Assuming that this steam is conducted from the boiler to the cylinders and the exhaust through steam pipes and connections having an average sectional area of 28,274 square inches (or 6 inches in diameter), the steam has a flow of 8,960 lineal feet per minute. Assume this 60 miles per hour as a maximum of speed (although claim has been made that a speed of one mile in 39¾ seconds has been attained, or 91 miles per hour), and by comparing the same to the minimum of the exhaust, you will recognize how hopeless is the task of designing a standard exhaust pipe and stack that will produce an equally good effect for the wide range of conditions required. While the evolution of other parts of the locomotive has been very marked, the draft appliance is substantially the same as it was on the first engine. It works on the old-time principle of full stroke or nothing.

If you will read the report of the committee, and the discussion that followed, at the last Master Mechanics' convention, you will realize that there is a very marked difference of opinion and practice among our most progressive mechanics. While one advocated a smooth and gradual taper from the base to the tips, another was of the opinion that it would be better if the exhaust pipe were turned bottom side up; while one cautioned his fellows against irregular surfaces or contractions or enlargements in the area of the passage, another thought a chamber or reservoir in the pipe would prove beneficial.

The reduction of the stack near its base with a double taper depends on a recognized scientific fact, that a jet of fluid issuing from an opening has a form known as the "contracted vein." Trautwine says that while all fluids, water, mercury, etc., whatever may be their specific gravity, will flow with equal velocity from opening of equal sizes under equal heads, it has been found that with a nozzle or tube constructed on certain lines (see fig. 10, p. 260 of 1887 edition, Trautwine's Pocket Book), the discharge may be increased 50% beyond its theoretical opening. It is evident that the effect of making the locomotive stack conform to the contracted vein is to reduce the friction of the gases, increase the velocity of their discharge, and offer less resistance to the action of the exhaust, thereby increasing the vacuum and reducing the back pressure in the cylinders.

It is, of course, impossible to construct a stack strictly on these lines; and from my own experience in constructing stacks of 18 inches extreme diameter down to 13 inches, I have found that we get the best results with a stack contracted to 15 inches at a point 12 inches above the saddle and tapering to 18 inches at the top, with a total length of stack of 63 inches. If contracted below 15 inches the engine will make steam very slowly under natural draft and when first fired up. While the length above is not arbitrary, I have found that with 54 inches or less in length, the results are not so good.

While considering this principle in a stack it occurred to me that the same form might be used in the exhaust pipe carrying out the full lines as laid down in Trautwine, as shown in Fig. 1, the top of the pipe being on a line with the base of the stack; this, however, defeated all that we had gained by improving the shape of the stack, for it prevented a proper combinatien of the gases with the exhaust at the line of contraction. I reduced the height gradually as shown by lines *A*, *B*, *C* and *D* until at the present time the top is about three inches above the center line of boilers, and while I have not yet succeeded in establishing the correct relation between the top of the pipe and the stack, I still think the principle is correct, and its use will result in a decrease of back pressure in the cylinder, as well as a

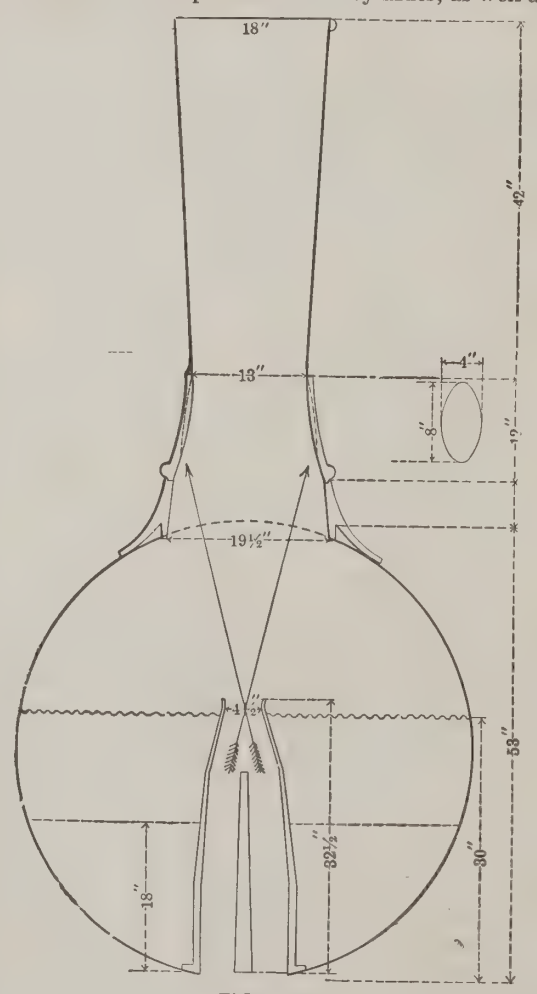


FIG. 2.

milder draft that will lead to fuel economy. The developments in connection with the compound locomotive have demonstrated that steam can be maintained with a much milder draft than is usually employed in the simple engine, and a large share of the fuel economy of the compound (particularly in the four-cylinder type) is due, I believe, to this cause.

I wish to say a few words about the height of the bridges in the ordinary form of single exhaust pipes. It is my opinion that the hump that appears above the atmospheric line in the indicator diagrams from many engines with single nozzles is not due to the exhaust blowing over, but to the ordinary increase of resistance to the outflowing steam. In my experiments I have found that the column of steam in the exhaust pipe is not instantly compressed or altered in direction at the nozzle sufficiently to insure a central discharge into the stack, but is deflected from side to side at the relative angles at which it approaches the discharge. In my experiments with an exhaust pipe, as shown in Fig. 2, in which the bridge approaches within 8 inches of the nozzle, the effect was to send the steam from side to side, and in three months I found that each side of the stack base was cut out to a depth of ¼ inch, in an elliptical form, which was 8 inches in length and 4 inches in width. You will note that the column of steam remains at the same general angle at which it approached the exhaust tip. This points to the necessity of a low bridge that will allow the column to straighten before it reaches the nozzle. The momentum of the exhaust will insure its upward tendency with a very slight bridge at the base of the exhaust pipe.

*Abstract of a paper by W. H. Lewis, read at the May meeting of the Western Railway Club.

Judge Bryant, in the Federal Court at Dallas, Tex., has issued an order vacating the receivership of the International & Great Northern Road.

Two trainmen, Ed Benson and George Rogers, said to be leaders of the striking Southern Pacific trainmen, were shot July 9, at Bakersville, Cal., by a non-union man named Ackley, whom they molested.

The Canadian Pacific Steamship Company has agreed to make a rate of $10 a ton on World's Fair exhibits from ports of China and Japan consigned to Vancouver, or $16 a ton through to Chicago. This is a reduction ranging from 33 to 65 per cent. Passenger rates are reduced about one-half.

President John M. Egan, of the Chicago, St. Paul & Kansas City road, has issued a circular stating that the Chicago Great Western Railway Company has taken possession of the Chicago, St. Paul & Kansas City as lessee, and will hereafter operate the same. The offices of the Chicago Great Western will be at St. Paul.

The Chicago, Burlington & Quincy, having practically exhausted the gravel beds south of Aurora, is arranging to build sheep yards in the pit. The yards and pens will cover 15 or 20 acres. All of the sheep from the Chicago, Burlington & Quincy & Chicago, Burlington & Northern lines will be unloaded there and prepared for market and shipped to Chicago as wanted.

A TAR'S IDEA OF A LOCOMOTIVE.—"Why," says he, "there's nothing manly about it. Watch a ship, now, with her canvas filling out, laying down to it just enough to show she feels the breeze, tossing the spray away from her bows, and lifting her head over the seas, as if she stepped over 'em. There's something like life there. There's something noble about a horse; he steps as if he knew he was going, was proud of his duty and able to do it. But the lubber—bah! that there concern comes insinivating, sneaking, and snorting along like a thundering long snake with a pipe in his mouth."

William Borden, an engineer on the Ontario & Western, was discovered dead in his cab July 1, under peculiar circumstances. He was in charge of an engine which acted as a helper for coal trains from Hancock Junction to East Branch. When near Fish's Eddy, a train which he was pushing broke in two, and the head engineer signaled to Borden to stop. As he did not do so the head brakeman was sent back to see what the trouble was. He found Borden dead, with his head out of the cab window. The fireman of the helper was in the second cab, and had not discovered the condition of the engineer. The only mark that could be found on the dead man was a small puncture in the back of the head behind the ear. It is thought that his head may have come in contact with a sharp stone in passing through the tunnel, or may have struck the bridge.

The Jackson & Sharp Company, of Wilmington, Del., intends to build the finest postal car that has ever been made in this country. It is to be as handsome as a working car can be made, and will have all the modern improvements now in use in the railway service of the Post Office Department. It will be a complete post office on wheels, and will be used as a working government exhibit at the World's Fair. The car will be in a special building on the fair grounds, and all the mail matter that is collected on the grounds will be taken to the postal car to be made up for distribution to different parts of the United States and elsewhere. A portion of the side of the car will be left open and so arranged that the fair visitors will have a clear view of the interior of the car without going inside.

A disastrous wreck occurred on the Wabash Railroad near Wabash, Ind., on the night of July 3. A solid stone culvert weakened by rains gave way under a rapidly running freight train, and the engine and nine cars plunged into a 22-foot chasm. On the engine at the time were the engineer, George W. Shorey, of Fort Wayne; F. E. Moore, fireman, of Lafayette; Harvey Dunlap, superintendent of bridges; Charles Helm, belonging to the same department, and Charles F. Wilcox, trainmaster, all of Peru, Ind. Every one of these was killed. The tender of the engine in the descent turned completely around and fell upside down, and Shorey, Moore and Wilcox were caught between the tank and the boiler head and crushed to death, while the others were killed by the falling cars, all being held down in from three to six feet of water by the wreckage.

Electricity in Railroad Shops.*

An enumeration of the applications of electricity in railway repair shop use might be as follows: Illumination by arc or incandescent lamps, or both; transmission of power to distant shops or locations where the only other resource might be to have a separate steam plant or for movable machines used around work, such as portable drills, etc.; also traveling cranes, transfer tables and elevators; welding of metals of the same or different kinds, and the use of the current in plating room operations. This comprises the list to be considered in this paper.

In considering the first item, illumination, it is not the intention to bring forward the claims of any particular system or maker. It may be advisable to use the same current that produces the lights for some other purposes, and if for motors, the generators must be of the direct current type, as the alternating current is not successfully used for such purposes. There are systems where arc and incandescent lamps are used together on a 220-volt circuit, and this would seem an ideal system for shops where large central spaces and aisles could be lighted by arc lamps, and individuals or localities needing a greater intensity of light than could be given by the general illumination could be supplied by incandescent lamps on the same circuit. The economy of this plan lies in the fact that one generator is sufficient for both services and the work is also simplified. It is also possible to put in motors on the same circuit, but they tend to make the lights unsteady, and where many of them are in use it would be advisable to have a separate generator for that purpose, which could also supply the current for transfer table and traveling crane motors, as well as for motors used on individual machines. The generator for such service should be a direct current compound-wound dynamo with a complete metallic circuit, and the current should be about 220 volts.

One difficulty to be overcome in the use of small motors is their speed, as compared with all machines used in iron working. One convenient way of overcoming this would be to mount the motor on a plate, on which standards would carry a shaft and pulley so arranged that the pulley would be in frictional contact with the pulley on the armature. This counter pulley could be 10 or more times the diameter of the other and have a grooved cone on one side, from which a round belt could be run to a grooved pulley on the machine to be driven. By a system of idlers, tension and direction could be given to the belt. The motor having a constant speed, the cone would permit changes of speed at the tool. Many forms of special tools could be devised in this connection. In the Crewe shops in England portable drills capable of drilling 1-inch holes in steel are in use which are electrically driven. The drill spindle is the arbor of a worm wheel and a dynamo armature is on the shaft of the screw which works the wheel, and the whole apparatus—dynamo and all—weighs 65 lbs. Another application used in the same shop is a saw for cutting tubes out of locomotives. The saw arbor is also the arbor of the dynamo armature, and the saw is just large enough to enter the tube; the framework carrying this is held up against the tube sheet by hand, an eccentric motion forces the saw through the tube on one side, and then by another motion the saw is carried around, completely severing the tube. The saw is then returned to the center and withdrawn, and the tube can then drop down. The beauty of this operation lies in its celerity of cutting and in the fact that the tube end is neatly cut off square and ready at once for scarfing for a new safe end.

An important and highly interesting use of electricity is its application to traveling cranes and transfer tables. The 100-ton cranes in use in the Baldwin Locomotive Works are a sample. Here is a crane extending over a space of nearly 75 feet, with all its motions produced by motors, and the range of movement, speeds and power shows the facility with which electricity can be adapted for this service. The Chicago, St. Paul, Minneapolis & Omaha Railway at Hudson, Wis., have some electrically operated transfer tables which have been in operation now for over a year, and Mr. Preston, the master car builder, says that they have been entirely successful, and he sees no reason why they should not continue to be so. A nearly similar table is in use at the Cheyenne shop of the Union Pacific Railway. The power for the Hudson table is taken from an overhead wire, with a trolley somewhat similar to our street car systems; the trolley line being supported by arms extending from poles arranged along the edge of the pit, while the Cheyenne table has a trolley line running through the center of the pit from end to end, attached to one of the supporting timbers. Electricity has been applied in this manner to a number of transfer tables; among others can be noted two at the new Tacoma shops of the Northern Pacific, one at the Aurora shops of the Chicago, Burlington & Quincy, one for the Wagner Palace Car Company and three upon the Union Pacific road.

The new Grant locomotive shops in Chicago have four traveling cranes which are electrically driven. In these three separate motors are applied, one to propel the bridge through the building, a second to traverse the trolley upon the bridge and a third to hoist the load. The 40-ton crane is provided with two trolleys, each trolley having two motors for the uses just mentioned for the other cranes, and they consider that the application of separate electrical motors for the different motions of cranes of this class is advisable as tending to largely simplify construction, while with lighter cranes gearing can be introduced, and a single motor used for more than one purpose.

One of the most interesting and useful ways of utilizing the electric current is in electric welding. This process has been in commercial operation since July, 1888, and machines are now built to suit almost any demand. In reply to request the Thomson Electric Welding Company sent the writer a copy of the *Iron Age* of Jan. 28, 1892, wherein is a full history and description of the operations of this company. The article contains also a list of metals, alloys and combinations of metals—all tested as to successful welding qualities, and illustrations of a number of forms, many of which it would be impossible to weld by ordinary means. As to the limitations of the process, the article in question states: "Experimentally a wire .02 of an inch in diameter has been welded, and as far as large areas are concerned, it depends more upon the demand than to any limitation there may be in the process."

Very favorable descriptive and analytical reports on the subject were made by the United States Naval Board and by Profs. Sylvanus P. Thomson and Alexander B. W. Kennedy, in February, 1890. Among the beauties of this process is the perfect control of the current and the perfect safety of the operator. An alternating current generally of 300 volts is by a transformer changed to an electromotive force of about 1 volt or less at the machine, which corresponds to a potential about the same as a common house battery, the current from which is almost imperceptible to the touch. The article in the *Iron Age*, together with the reports mentioned, give such a complete expositon of the whole subject that it is probably unnecessary to ask further of your time in this connection.

The dynamo machine was first made an adjunct to electro-plating processes in 1842, and the subject is one full of interest to the experimenter and chemist. This process has almost entirely displaced the older and more unhealthy methods, and very many variations of coppering, gilding and plating with various metals are possible to the experienced operator. The dynamo is generally of a special form, and designed to deliver a direct or continuous current of low voltage but large quantity. Railroads having large passenger equipments will, by a small expenditure for an electro-plating outfit, be able to keep up a good appearance of their car trimmings and dining car table service, headlight reflectors, etc.

The dynamo room containing the electrical plant for the repair shop of a good-sized railroad would have:

1. One or more dynamos for lighting, the number being dependent upon the conditions above stated.
2. One or more dynamos for power transmission, etc. Where steadiness is not an absolute requirement, lights for dark places, vaults, etc., may be used on this same circuit.
3. Dynamos for electric welding. The current from these can be used under the same conditions as just stated, but not so largely.
4. Dynamo for the plater.
5. Switchboard at which these various circuits are controlled and which would be fitted up with lightning arresters, voltmeters, ammeters, switches, rheostats, ground detectors, etc., all being instruments for measurement, regulation or control.

These dynamos may be driven by friction pulleys on a line shaft, and the model establishment will have a special engine so arranged as to run the shaft when the main source of power is shut down, or for night circuits in round houses or other places where night work is done.

There are other applications of electricity in the way of signals, recording devices and the like, which probably need nothing more than mentioning, and which are included in the grand total of the convenient and useful employments of the electrical current in railway shop operations.

*Read before the Northwest Railroad Club by C. A. Seley, M. E.

Crucible Firebox Steel.

In a recent circular letter issued by Howe, Brown & Co., Ltd., of Pittsburgh, relative to the subject of steel for fireboxes, discussed at the recent Master Mechanics' Convention, the following statement is made:

Referring to the subject of firebox steel, discussed recently by the railroad master mechanics at their convention at Saratoga, we wish to confirm the position then taken by our representative, Mr. E. S. Jackman, that in our judgment steel is now being sold at a price which prohibits the use of the best material for this important work. Our views on this question are based upon a long experience in the steel business, and careful attention to this particular line. We believe that it can be fairly claimed that our concern, then known as Hussey, Wells & Co., was the first mill to produce a satisfactory quality of steel for fireboxes, and that our steel occupied for many years the leading position on the market.

The quality of steel produced by us for fireboxes at that time was made by the crucible process, and it displaced largely the high grades of iron and copper then used for that purpose. As stated to the Convention by Mr. Jackman, we relinquished the manufacture of crucible plate steel for the reason that it could not be placed in profitable competition with open-hearth steel, although we believed then, and still remain of the same opinion, that when crucible firebox steel gave way to the softer and cheaper material, the railroads of this country sacrificed strength and long life in the firebox, and gained only a slight advantage in time and labor which was in favor of the softer steel.

While we have not continued actively in the manufacture of crucible firebox steel to any great extent, but have been directing our exclusive efforts to the manufacture of fine steel for tools, springs, etc, we have always had the conviction that open hearth steel or basic steel for firebox use would eventually prove unsatisfactory, and that we could and would at some time return to the manufacture of the same crucible firebox steel which was formerly bought by all the leading locomotive works and railroads in this country, many thousand locomotives being equipped with fireboxes made from our steel, some of which we have reason to believe are still in existence, having lasted 20 years or more.

The fact that our plant is just as well equipped for the manufacture of open hearth steel as for crucible will no doubt protect us from the charge of having any personal preference in advocating our opinion that firebox steel produced by the crucible process is the best and most reliable, and we to-day are as able to produce firebox steel for locomotives that will give as good results as the steel produced by this concern 20 or 25 years ago. We believe that a careful investigation into the merits of fireboxes made from our steel will develop sufficient facts to substantiate our position.

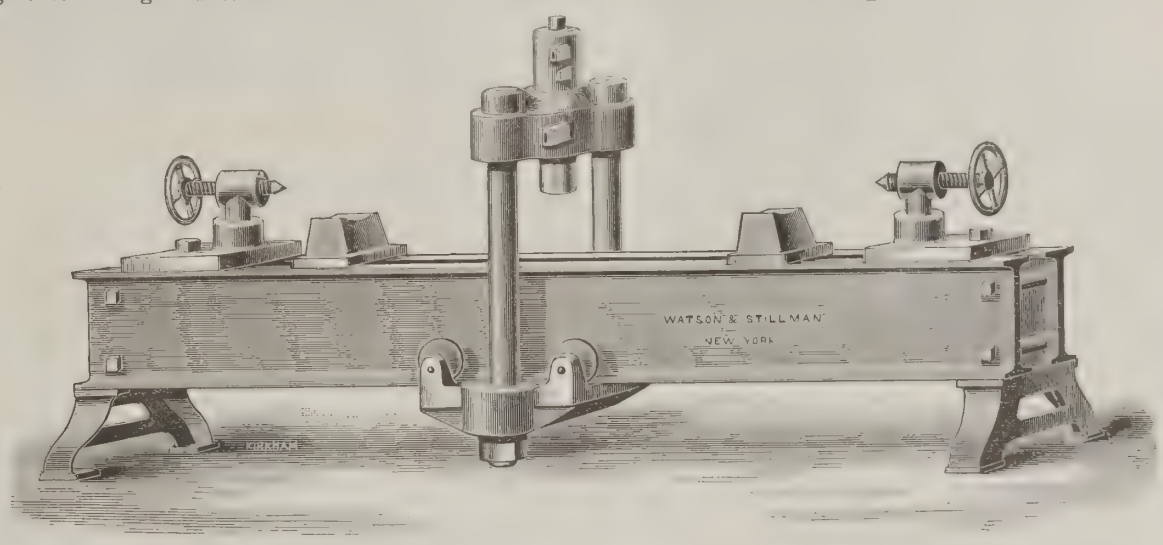
The Geometric Drill Co., of Boston, Mass., had on exhibition at the conventions held in Saratoga last June one of their drills for boring irregular shaped holes, and report that it has since received several orders from those who saw it in operation there, and that the demand for it is increasing very rapidly.

The Ashton Valve Company, of Boston, announces that it has purchased the entire plant, material, and all the patents of the Boston Steam Gage Company; and also that it has secured the services of Mr. H. L. Willard, formerly manager of the Boston Steam Gage Company.

The Ashton Valve Company will continue the manufacture of all classes of steam pressure and vacuum gages, hydraulic gages, water pressure and ammonia gages and all similar instruments used in connection with steam plants, being the now sole manufacturer of the Boston patent steam gage.

Hand Power, Car Axle, Straightening Press.

This tool is manufactured by Watson & Stillman, New York, and, as shown by the accompanying cut, is built from wrought iron beams with a jack of peculiar construction mounted upon a carriage which rolls freely from end to end upon the flanges of the beam. There are at each end centers mounted in the carriage which are adjustable from the bed, which have the spindle holding the screw resting on a spring and with sliding blocks inside of this. The ram, which has a motion of 4 inches, can be moved up or down, to or from bending position, without the labor of pumping, by means of the lever in the lower socket, shown in the cut. Greater variations from this have to be taken in the blocking. In operating the machine the carriage holding the bending device is thrown to one end of the machine, as it can be easily, with one hand, and then the machine is free to have the work placed upon the blocks without any drawing out endwise. The screw can then be brought up into the centers, and will raise the axle off the blocking. When the pressure is applied



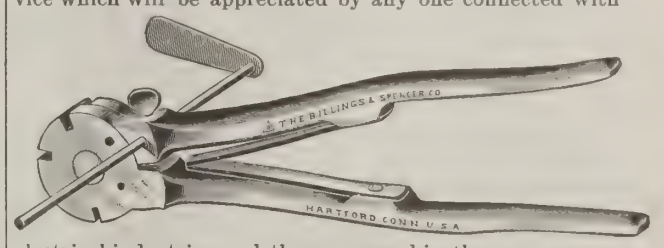
the centers, and their spindle are first forced down upon the spring upon which they rest, until the axle rests upon the block, then when the bending takes place they follow the centers, being perfectly free to move vertically.

The bending power of the press is about 75 tons, which is sufficient to bend a 4½ inch iron bar on 30-inch centers. Weight, 1,200 pounds.

Two New Devices.

The accompanying illustrations show two of the latest productions in small appliances of the Billings & Spencer Company, of Hartford, Conn.

Fig. 1 is what is known as the Billings Wire Cutter, a device which will be appreciated by any one connected with

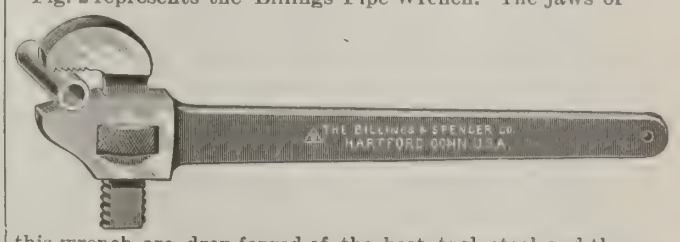


electrical industries and those engaged in the many operations in which to-day wire forms so important a feature.

The uses for which the tool has been designed can be readily seen from the cut.

It is drop forged from the best tool steel, and provided with four cutting edges on the rim and two which are inclosed. It has also an adjustable gage, so that wire can be cut accurately to any length. The workmanship is of the same high quality which characterizes all the appliances made by the Billings & Spencer Company. The total length of the tool is 10 inches.

Fig. 2 represents the Billings Pipe Wrench. The jaws of



this wrench are drop forged of the best tool steel and the handles of the best grade of machinery steel.

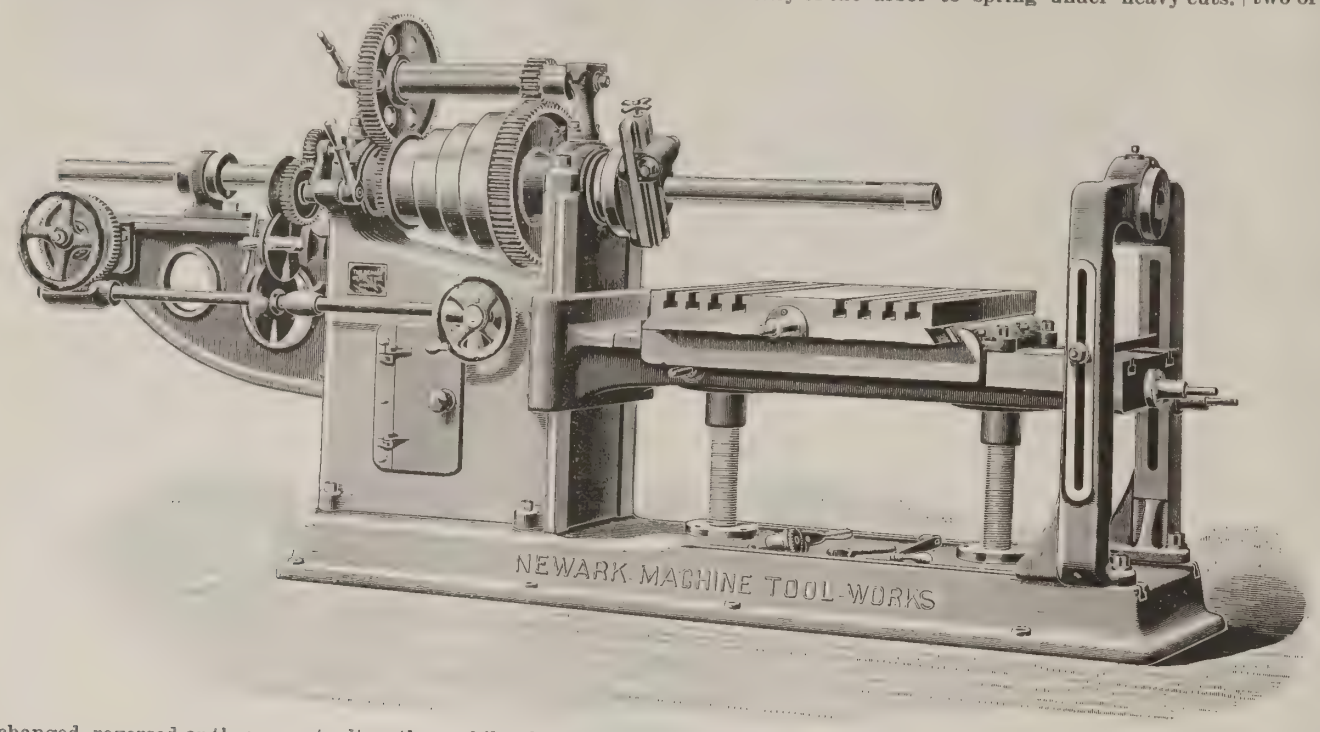
This wrench offers many advantages over similar tools, being simple in design, of few parts, and characterized by the best workmanship and finish. A special feature of superiority is found in the fact that no matter how large or small the size of pipe for which it is adjusted, the angle of the jaws always remains the same.

The total length is 14 inches, and is made to take pipe from ⅛ inch to 1⅛ inches.

Horizontal Boring and Drilling Machine.

The illustration herewith shows the smallest size of the horizontal boring machines which are the special product of the Newark Machine Tool Works, Newark, N. J. They build them in four sizes with 3 inch, 4 inch, 5 inch and 6 inch bars respectively, making the carriages and tables to suit the customer's wants.

The distinguishing features of this tool is the friction feed which gives a wide range of feeds, is reversible, and can be changed, reversed or thrown out altogether, while the machine is in motion. It has been in use for nearly three years and is spoken of very favorably in some letters of recommendation published by the makers. Among other points may be noticed the strong form of the yoke to brace the table, the double bushings in the yoke to prevent wear of the boring bar or arbor; the strong form of table, which is not opened as usual to receive the saddle screw; the stiffened saddle with its heavy flanges; and the convenient facing attachment, which can be bolted to the bar as well as to the face-plate.

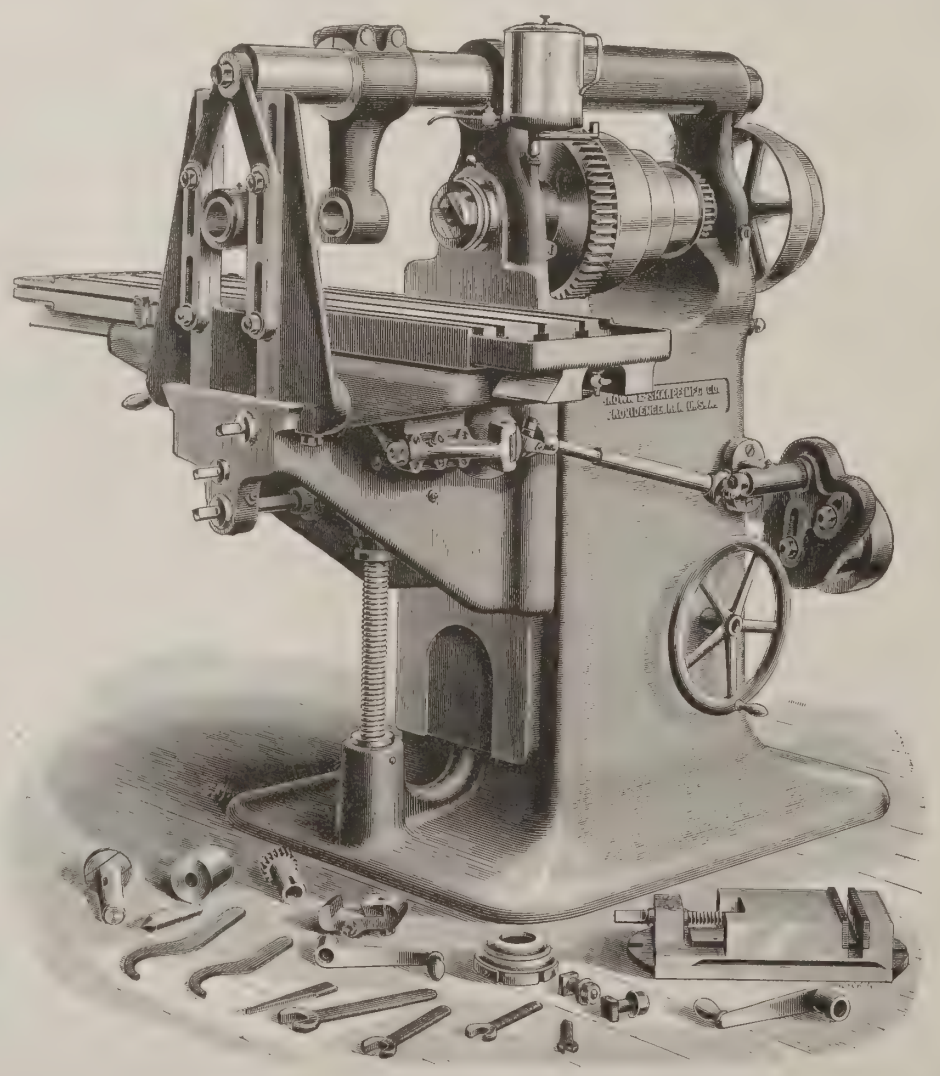


This machine is well adapted also for heavy, flat and face milling; and a power cross feed may be furnished for this purpose.

Following are some of the chief sizes:—Diameter of bar, 3 inches; length of table, 5 feet; swing over carriage, 3 feet, 3 inches; diameter of large speed of cone, 16 inches; width of step 3⅛ inches; carriage, 30 inches square; length of machine over all, 10 feet, 9 inches; weight, 7,500 lbs.

No. 8 Plain Milling Machine.

This machine is manufactured by the Brown & Sharpe Manufacturing Co., of Providence, R. I., and is adapted for a larger and heavier class of milling than the No. 4 machine, illustrated in the March NATIONAL CAR AND LOCOMOTIVE BUILDER, having wider cones for belts, larger spindle, heavier table and saddle and more powerful feed. The spindle has a front bearing, 3¾ inches diameter, 5½ inches in length, and a rear bearing, 2½ inches diameter, 5 inches long. In addition to the taper hole for receiving the arbor, the spindle has a recess across the end and a cap nut, by which an arbor having a clutch collar is positively locked for driving the cutters. The spindle boxes are bronze, tapered, and have means of compensation for wear. The table is heavy, 66 inches long, 16 inches wide, having a working surface 54 inches long and a bearing in saddle 40 inches in length. It has three T slots running the entire length between the pans at end of same. It may be lowered 19½ inches below the center of spindle, and has an automatic feed of 48 inches, and an adjustment in line with spindle, of 9¾ inches. Milling may be done 21 inches from face of column, and cutters 16 inches diameter may be used.



The cone has three steps (the largest 13¾ inches diameter) for 4½-inch belt. The back gearing is 8⅛ to 1, thus giving with the wo speeds provided on countershaft, 12 speeds for spindle. The feed cones have two steps, and by transposing these and changing the feed gears, eight changes of feed, from .02 inches to .25 inches to one revolution of spindle may be obtained in either direction.

The overhanging arm is of steel 4¾ inches diameter, and may be rigidly connected to the knee by an improved arm brace, which is readily adjustable and has a bearing for the outer end of arbor, thus allowing the usual arbor support to be used at any intermediate point near the cutter to counteract the tendency of the arbor to spring under heavy cuts. The vise has jaws 7⅛ inches wide, 1⅞ inches deep and will open 4½ inches.

The overhead works have two sets of tight and loose pulleys 16 inches and 20 inches in diameter for 5-inch belt, and the countershaft should run 112 and 140 revolutions per minute.

The Detroit Lubricator Company, of Detroit, Mich., has issued a catalogue and price list of its articles of manufacture, including different styles of the "Detroit" sight feed lubricator, the "Detroit" standard glasses and gaskets, air-pump lubricators, rod and guide cups, the "Garfield" injector, the Pendry throttle valve for locomotives and the "Detroit" supplemental steam dome, which is a very neat and efficient dome or "fountain" to be located on the center of boiler head for all steam connections.

The catalogue also illustrates the new method adopted by this company of applying the discharge end of tallow pipes to the steam pipes. This method consists in changing the discharge end of the tallow pipe from the top of the steam chests to the extreme ends of the steam pipes. It is found that by this change the back pressure is greatly lessened, and the oil is carried by the force of the steam directly to the wearing parts of the valves and cylinders, thus securing a constant supply of oil under all variations of the throttle besides effecting considerable economy in oil.

The B. F. Sturtevant Company, Boston, Mass., have shipped a three-room lumber drying apparatus to Chili, South America. This company was recently in receipt of an order for an apparatus for six standard kiln rooms from the Russian Government.

Seven carloads of apparatus have been shipped since Feb. 1 to Oregon and Washington, most of which have been used for drying shingles. Also seven large fans have been recently shipped to Bolivia, South America, for use in one of the largest silver mines in the world. Four of these are driven by the Sturtevant double-inclosed steam engines, two of them by the Sturtevant compound steam engines and one by a Sturtevant electric motor, all direct attached. This electric fan is constructed so as to hang from a rope in the mine shaft.

Recent large orders have been received from Cuba, Mexico, and other foreign countries, showing that the reputation of the Sturtevant goods is world wide.

The Egan Company, of Cincinnati, Ohio, are about to issue a handsome catalogue of nearly 300 pages. It will be a specimen of typography, a souvenir of engravings, and a volume of information relating to this company's extensive line of the most recent mechanisms for large and economical productions in woodworking.

The Ewald Iron Company, with mills at Louisville, and Tennessee Rolling Mills, Kentucky, have made a specialty of the manufacture of staybolt iron for upward of twenty-five years, and always maintained the highest standard in quality and finish. Their charcoal hammered iron and flange iron plates are too well known to require any special mention.

The works of the Brown & Sharpe Manufacturing Company, of Providence, R. I., will be closed from Aug. 1 to 13, inclusive, for annual vacation of employés and for repairs. The office will be kept open as usual, and all orders will be promptly filled for machinery or tools usually kept in stock.

Our Directory.

Atchison, Topeka & Santa Fe.—Herbert Higgins is appointed Master Mechanic at La Junta, Colo.

Atlantic & Pacific.—R. English has been appointed General Master Mechanic, with office at Albuquerque, New Mexico.

Birmingham & Atlantic.—J. J. Thomas, Jr., Talladega, Ga., appointed Master Mechanic.

Central of Georgia.—J. F. Babbitt, Jr., has been appointed Purchasing Agent, with headquarters at Savannah, Ga.

Chattanooga, Rome & Columbus,—W. C. Epperson has been appointed Superintendent, vice J. H. McKenzie resigned.

Cleveland, Cincinnati, Chicago & St. Louis.—O. H. Jackson, Master Mechanic Brightwood shops, resigned; succeeded by F. M. Lawler, transferred from Mattoon, Ill.; G. S. McKee made Master Mechanic at Mattoon; J. H. Berry, Assistant Master Mechanic at Delaware, O., made Master Mechanic Cincinnati Division.

Cleveland, Lorain & Wheeling.—Frank M. Townsend, Superintendent, resigned; succeeded by T. J. Bigelow.

East Coast Lines.—W. L. Crawford has been appointed General Superintendent of these lines. The office of General Manager has been abolished.

International & Great Northern.—T. M. Campbell has been appointed General Manager, headquarters at Palestine, Tex.

Long Island.—John H. Clemons has been appointed Superintendent of the Atlantic Division, with headquarters at East New York, to succeed E. K. Morris, resigned. Benjamin Norton, First Vice-President, has been appointed General Manager.

New York & New England.—Geo. H. Cross been appointed Superintendent of the Western Division, with headquarters at East Hartford, Conn., vice Stephen Noon, resigned.

Ohio Southern.—Mr. M. Fail has been appointed Master Mechanic, vice A. E. Tremp, resigned.

Richmond & Danville.—A. W. Gibbs has been appointed Division Master Mechanic, with office at Atlanta, Ga., to succeed W. A. Walden, resigned. C. P. Hammond has resigned as Superintendent of Atlanta & Charlotte Air Line Division. The office of Superintendent of Motive Power has been removed from Atlanta, Ga., to Washington, D. C.

San Antonio & Aransas Pass.—Mr. B. F. Yoakum has been appointed Manager.

Savanah, Americus & Montgomery.—J. J. Sullivan, appointed Master Mechanic and Master Car Builder, vice Wm. Argue; headquarters, Americus, Ga.

South Bound.—E. Ford has been appointed Superintendent, with headquarters at Savannah, Ga.

St. Louis Southwestern.—T. W. Kennan, Superintendent, has resigned. J. W. Dickinson has been appointed Division Superintendent. J. A. Edson has benn appointed Superintendent, headquarters at St. Louis, Mo.

Union Pacific—Robert W. Baxter has been appointed General Superintendent of the Pacific division of the Union Pacific, with headquarters at Portland, Ore., in place of E. B. McNeill, resigned. N. J. O'Brien has been appointed Superintendent of the Washington line of the Pacific division of the Union Pacific.

Utah.

The land of sunshine and flowers—rich also in mineral and agricultural resources—is best reached by the Rio Grande Western Railway. See that your excursion tickets read both ways via that road, which offers choice of three distinct routes and the most magnificent railroad scenery in the world. Send 25 cents to J. H. Bennett, Salt Lake City, for copy of illustrated book, "Utah; A Peep into the Mountain Walled Treasury of the Gods."

Employment.

WANTED—An active man as Superintendent of a Freight Car Works. None need apply unless having large experience in construction of cars and handling of men. State where, when and how long employed and in what capacity, with references. Address "Superintendent," care NATIONAL CAR AND LOCOMOTIVE BUILDER.

NATIONAL CAR AND LOCOMOTIVE BUILDER

SEPTEMBER, 1892.

CONTENTS.

This is an "off" year for strikes.

The length of railways in operation in Japan now exceeds 1,700 miles.

A new round house is being built for the Lehigh Valley road at Rochester, N. Y.

The Wisconsin Central is to add 30 passenger cars and six new sleeping cars to its equipment.

The Richmond locomotive Works are building two large locomotives for the South Bound road.

The Wabash has adopted aluminum leaf for numbering, lettering and striping engines and tenders.

The Pullman Palace Car Company is building an elegant special car for the president of the "Soo" line,

The Pullman company have just delivered ten passenger cars to the New York, Lake Erie & Western.

More than 200 panels of native wood will enter into the interior decoration of the Washington World's Fair building.

The New York Central & Hudson River Railroad Company has bought the Adirondack & St. Lawrence Railroad.

The Old Colony Company has begun work on the third and fourth tracks on the road between Boston and Braintree, Mass.

The manufacturers of the Lister plushes, whose works were at Huddersfield, England, are to establish works at Jamestown, N. Y.

The Brainerd & Northern Minnesota has ordered 125 logging cars from the Russell Wheel & Foundry Company, of Detroit, Mich.

Plans are prepared for an office building that the New York, New Haven & Hartford Company purposes to erect at New Haven.

The Eleventh Annual Convention of the National Association of Stationary Engineers will be held in Atlanta, Ga., beginning Sept. 6.

A special train of four cars over the Pennsylvania Railroad was recently run between Philadelphia and Washington, 140 miles, in 150 minutes.

Repairs are being made to the New York Central's freight house at Buffalo, which in the latter part of July was damaged by fire to the extent of $40,000.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered from the Rhode Island locomotive Works two heavy compounds and two switching engines.

Orders have been issued by the railroads included in the Trans-Missouri Association that cars, when loaded with grain, must be loaded to their marked capacity.

The discoveries of coal in the territory of Neuquen, Argentine, promise to be of great importance. The area underlaid by coal is said to be about 500 square miles.

Last March the Philadelphia & Reading's repair shops at Wayne Junction, Pa , were destroyed by fire. A new brick structure of larger proportions has been erected on the old site.

A through train from Chicago, on the Atchison, Topeka & Santa Fe road, was wrecked at Petersburg, Colo., Aug. 9, by spreading of the rails. Eighteen persons were injured.

A new observation engine for the use of General Superintendent Voorhees, of the New York Central & Hudson River road, has recently been built at the West Albany shops.

A pound of coal will yield enough magenta to color 500 yards of flannel, vermilion for 2,560 yards, aurine for 120 yards, and alizarine sufficient for 155 yards of Turkey red cloth.

A rock from a blast in a bluff crashed into the smoking car of a St. Louis, Keokuk & Northwestern train, Aug. 6. fatally injuring one and seriously injuring another passenger.

The "Soo" Line, which is building a fleet of steamers to compete for traffic on the great lakes, has launched the first steamer. It is of the whaleback type and 320 ft. long over all.

Under the name of the Central Railroad of Pennsylvania a corporation has been formed in Pennsylvania to build and operate a line between Middletown and Steelton, a distance of six miles.

The World's Fair buildings will be dedicated on the 21st of October instead of the 12th. The change of date of dedication was made in the interest of chronological accuracy.

It is estimated that the 35 railroads which enter Chicago will expend $110,000,000 in increasing and improving their equipment and facilities for transporting World's Fair visitors and freight.

Last spring the Northern Pacific's hospital at Missoula was burned. The company is now building a hospital which will be complete and modern in every detail. Its cost will be $30,000.

The system of transferring passengers from the elevated station of the Pennsylvania Railroad, Jersey City, to the upper decks of the ferryboats is now in vogue, and is working successfully.

On the afternoon of July 31 the blacksmith shop of the Great Northern at St. Paul was partially burned. The damage amounted to $15,000. The work of rebuilding was immediately begun.

It is reported that car shops and roundhouses will be built at Chillicothe, O., for the Baltimore & Ohio Southwestern at a cost of $250,000, of which sum $85,000 has been subscribed by the town.

The Rhode Island Locomotive Works have delivered two compound passenger engines to the Minneapolis & St. Louis, and are now engaged upon the last 10 of the order for 37 engines for the Wabash.

The New York, New Haven & Hartford are having 76 passenger cars built, 20 of which are to be vestibuled drawing room cars to be built by the Barney & Smith Manufacturing Company, of Dayton, O.

An open switch caused the wreck of a gravel train on the Toledo, Walhonding Valley & Ohio Railway, near Coshocton, O., Aug. 15. Six workmen were crushed to death and 15 others badly injured.

One of the most costly and artistic passenger stations in the South is to be built at Augusta, Ga., by the Union Depot and Terminal Company. It will cost $200,000. An iron trainshed will be attached to the depot.

A scaffold at the Pittsburgh Locomotive Works, in Allegheny, collapsed Aug. 9, and two tinners who were working on the third floor were precipitated to the pavement, a distance of 25 feet. Both men were fatally injured.

During the week ending Aug. 13, 318 carloads, containing 3,818 tons of fruit, were shipped east from California over the Central Pacific. So far this season, 6,600,000 pounds more fruit has been shipped than last year.

The Philadelphia & Reading has completed its new repair shops at Wayne Junction, Pa., which were destroyed by fire last March. The structure is 400 feet long and 475 feet wide. The side walls are of brick and the roof is of iron.

An engine on the Chicago, Milwaukee & St. Paul being reversed, "plugged" and deserted by the crew in the face of a collision with a work train, Aug. 5, is reported to have backed away after the collision, and run ten miles before stopping.

The New York, Chicago & St. Louis has ordered 10 locomotives of the Baldwin Works. Nine are to be simple engines and one of the Baldwin compound type. All are to be 10-wheel engines, cylinders 18 × 24 inches, and weigh about 50 tons each.

One of the latest practical applications of aluminum is found in its use in making car window frames. Such window frames are now made at Neuhausen, Switzerland. Extreme lightnesss is the main feature of the frames.

Articles of corporation have been filed at Springfield of the Illinois Railroad Company. It is proposed to construct a railway line from Chicago to Rock Island. The capital stock of the company is $4,000,000, and it will have its headquarters in Chicago.

The body of Mr. Samuel F. Keller, Sheriff of Dauphin County, Pa., was found beside the Pennsylvania Railroad track, east of Conewago Station, Pa., Aug. 16. He was accidentally thrown from a train during the night while passing from one car to another.

A circular has been issued by the Great Northern Railway, announcing the completion of its transcontinental line, 512 miles from Havre, Mont., westward to Spokane, Wash. The line is expected to be open to Puget Sound before the close of the year.

The Addison & Pennsylvania road, which was recently sold under foreclosure, is now being changed from narrow to standard gage and the new rails to be used are being delivered. The next step will be the purchase of new rolling stock, for which the company will soon ask bids.

The preference of shippers for railroad service instead of canals is demonstrated by a complaint of the Erie Canal boatmen that the railroads are doing all the business. Boats clearing Buffalo last year amounted to 294 more than for the corresponding period this year up to July 1.

The running time from Syracuse to Rochester was lowered recently by a special train on the New York Central. The distance, 81 miles, was made in 72 minutes. This is two minutes less than the Empire Express' fast time made July 4. The special consisted of Mr. Webb's private car and a day car.

The building of a fifth track between Philadelphia and Jersey City has been contemplated by the Pennsylvania Company for some time, but the track will not be built entirely for the present. Short sections of a mile or more will be built at convenient times until the entire line is completed over the New York division.

The California Capitol will be represented in miniature at the World's Fair by an exhibition of pickles. The women of Fresno county will distribute 2,500 pounds of raisins in souvenir boxes. A playing fountain of wine will form a feature of the viticultural display. A rose tree 24 inches in circumference will be one of California's exhibits.

The New York Central railway, in its exhibit at the World's Fair, will strikingly illustrate the improvements that have been made in railroad transportation by showing a complete vestibuled train, and along side of it a reproduction of the first train run on the Mohawk division, July 31, 1832, the cars of which resembled old-fashioned stage coaches.

Press dispatches from Paris state that the problem of long-distance telephone operating under water has been solved by a Frenchman, M. Oillot, Inspector of Telegraphs in Paris. The inventor feels sure of his success, and states that with his arrangement it will be as easy to converse between Paris and New York as it is now between Paris and Versailles.

The following notice has been posted on the Philadelphia division of the P. R. R.: "The use of intoxicating liquors by the employés of the Philadelphia division on duty must be stopped at once. Any employé found visiting a saloon or a place where intoxicating liquors are sold will be severely disciplined. Trainmen are on duty from the time they are called out."

The annual report of the State Comptroller of New Jersey shows that during the past year there were 1,500 accidents on railroads in the State. The number of persons killed in the accidents was 331; 204 were killed or injured by jumping from trains in motion. The elevation of the Pennsylvania Railroad tracks in Jersey City has greatly lessened the number of fatalities.

The Pennsylvania lines west of Pittsburgh are equipping their locomotives running into Chicago with a smoke preventing device, which gives excellent satisfaction. The fireboxes are fitted with the usual steam arrangement, but air is taken from beneath the grates so that it may be warmed before introduction to the firebox. A blower is to operate in connection with the arrangement, the opening of one valve in the cab throwing them both into operation. It is the intention to use this attachment only within the city limits.

The Midland Railway of England has adopted the Pintsch light as the standard method of illuminating their passenger cars. They have already caused the erection of three gas plants at various points along their line, and have ordered lighting equipment for 886 cars. This railway has abandoned the use of the electric system of lighting which they have had in use for a number of years, as they found it both too expensive and unreliable for service, and after due consideration have taken up the Pintsch system as being the one that best suited all requirements.

A compound engine has been built for the Pike's Peak (Abt system) railway by the Baldwin Locomotive Works. The engine has four carrying wheels revolving on the two axles which carry the pinions; and a two-wheel truck under the cab. The coal bunker is behind the cab, and water is carried in two side tanks with an aggregate capacity of 400 gallons.

Locomotives on the Buenos Ayres & Pacific Railroad.

The following particulars of different classes of locomotives on the Buenos Ayres & Pacific Railroad, Argentine Republic, are forwarded by a correspondent in Buenos Ayres. It will be noticed that the class of American locomotives mentioned has less heating surface than the class of English engines with same size of cylinders. The small boilers of early American engines militated seriously against their adoption abroad in competition with English engines, which usually had larger boilers aud were more economical of fuel--a very important matter all over South America. This defect has been overcome, however, in modern American engines, and those now in use in South America and other foreign countries are generally considered to be the most economical type in fuel and repairs, besides being much more convenient to manage.

	Cylinders.	Class of valve Motion.	Heating Surface. Tube. sq. ft.	Heating Surface. Fire-box. sq. ft.	Heating Surface. Total. sq. ft.	Grate area. sq. ft.	Weight Pounds.	Weight in service. Pounds.	Tender. Capacity of tender. gallons.	Tender. Class.	
Six wheel coupled goods with pony truck, outside cylinders; coupled wheels 4 ft. 1½ in.	16×22	Joys	931.20	99.10	1,030.30	17.	45,127	63,410	1,800	4 wheels	R. & W. Hawthorn, Newcastle-on-Tyne.
Four wheel coupled Passenger bogie engine, outside cylinder coupled wheels 5 ft. 6 in.	16×22	Joys	937.00	101.50	1,038.50	17.40	47,515	61,035	1,800	4 wheels	Ditto.
Four wheel coupled light passenger engine, outside cylinder, rigid leading wheels, coupled wheels 5 ft. 0 in.	15×22	Link	789.00	78.00	867.00	15.	38,270	53,410	1,800	4 wheels	Ditto.
Six wheeled coupled goods, with pony truck, outside cylinder; coupled wheels, 4 ft. 3 in.	16×22	Link	860.00	82.00	942.00	14.50	40,256	53,030	1,800	4 wheels	Sharp, Stewart & Co., Manchester.
Four wheel coupled American passenger, outside cylinder leading bogie; coupled wheels, 5 ft. 2 in.	15×22	Link	686.60	91.50	778.10	16.00	39,100	48,620	1,500	Bogie	Cooke Locomotive & Machine Co., New Jersey.
Four wheel, coupled passenger leading bogie, outside cylinder; coupled wheels 5 ft. 10 in.	16×24	Link	890.00	95.00	985.00	15.25	54,383	65,290	2,750	Bogie	Dubbs & Co., Gl'gow.

The Southern Pacific has a special steamboat to travel up and down the Sacramento River gathering fruit for shipment East. The boat collects large quantities to be made up in carload lots.

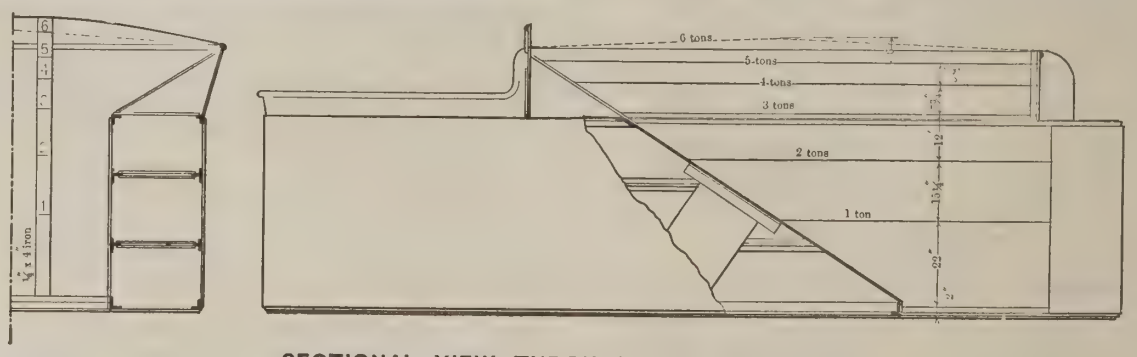
The Chicago, Rock Island & Pacific has acquired the right of way after a long struggle for a line through Lincoln, Neb., and will connect with the Union Pacific four miles south of the city. The company will build passenger and freight stations at Lincoln and make other improvements.

It is reported that in anticipation of an increased business next year, the Chicago, Burlington & Quincy intends to expend about $10,000,000 this year in extensions and new equipment. Of this amount, $1,600,000 will go into a new bridge and greatly enlarged terminal facilities at St. Louis. Two new iron bridges, each costing $43,000 more than the old structures they replace, are being erected; $100,000 will be spent on an enlargement of the company's Chicago freight house. In Northeastern Wyoming the most important and costly extensions are being made, one line running northwest to Sheridan, and another southwest through the Powder River country toward Ogden. The new equipment to be added includes fifty locomotives, fifty-nine passenger cars, fifty-five chair cars, 1,000 stock cars, 1,000 coal cars and 200 furniture cars.

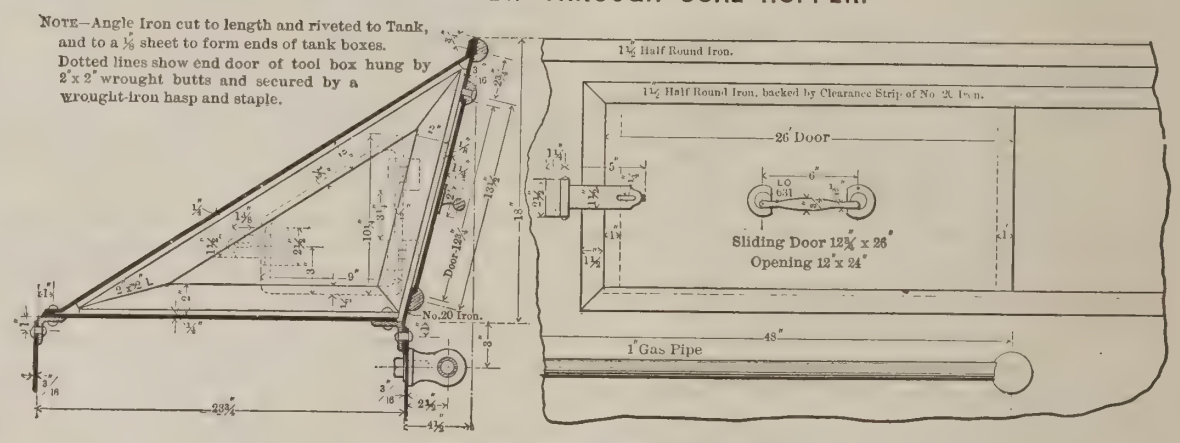
New Design of Tank for Locomotives, Wabash Railroad.

In the NATIONAL CAR AND LOCOMOTIVE BUILDER for April, 1892, we described and illustrated, with inset, one of a new class of passenger engines used on the Wabash Railroad, known as the Class F engine, and designed by Mr. J. B. Barnes, Superintendent of Motive Power and Machinery. We herewith present some additional illustrations of interesting details of these engines.

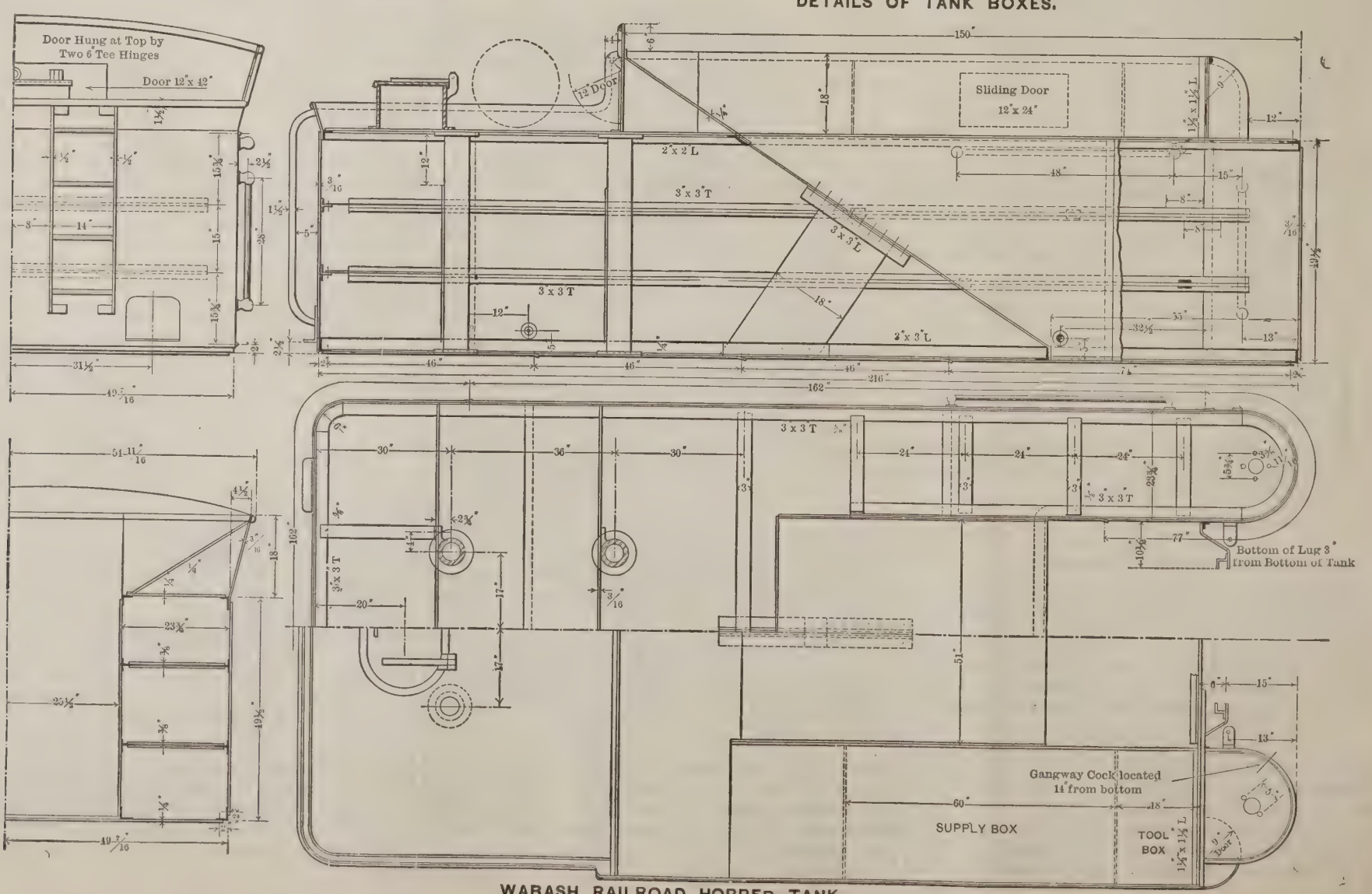
The general arrangement and detail drawings of the tank show an entirely new arrangement. which is a radical departure from past and current practice, and which has been designed since our previous description and illustration. The idea in designing this style of tank was to discard the use of the wooden tool boxes, and also to arrange that there would be no fuel carried but what would of its own weight find its way to the coal gate. With the ordinary style of tank a quantity of coal is always carried on top of the tank against the wings, as well as behind the partition board, around the manhole. This coal slacks from exposure and rots out the top of the tank and the wings. Again, in taking coal from the chutes, a considerable quantity is frequently lost by spilling over, if a full tank be taken. With this tank six tons can be loaded without any probability of losing one pound. The hopper style causes the coal to find a level at all times, and the fireman need never be compelled to go back into the rear of the coal pit for fuel.



SECTIONAL VIEW THROUGH COAL HOPPER.



DETAILS OF TANK BOXES.



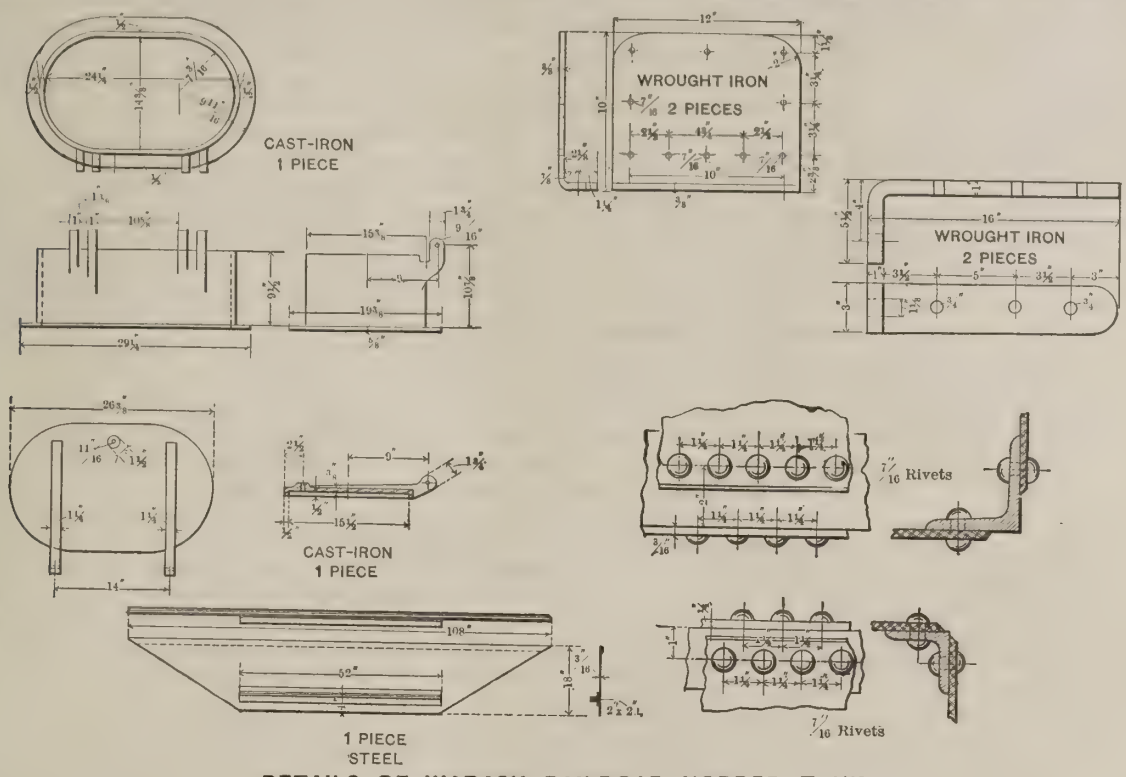
WABASH RAILROAD HOPPER TANK.

A register board is placed in the coal pit which permits the engineer at all times to know within a few pounds of the number of tons in the tank. This arrangement has quite a bearing or influence on coal dealers, and they give full weights, which cannot generally be said of them when dealing with the ordinary style of tanks.

The tool boxes and supply boxes are located in the wings, as shown in the illustrations, which protects all exclusively from the weather, there being no wooden boxes on the tank whatever. These boxes are protected with the Yale locks, and the engineer is held responsible for the tools and equipment, as there can be no complaint that others open the boxes and purloin the tools, etc.

Several of these tanks are now in use, and it is proposed to build them and replace the usual style as rapidly as possible. The engine crews are very enthusiastic over the new departure, and fully appreciate the convenience of the arrangement in general. In the construction of these tanks steel plate has been discarded, and iron for tank purposes will be used on the Wabash in the future.

It will be noticed that an oval shaped manhole 24 inches long is used on the rear of the tank. This is the proper design for a manhole on the tank of a locomotive, and avoids the necessity of the engine being stopped at a "chalk mark" at water tanks, and therefore saves time in making such stops, and also prevents much of the jerking of trains which is very unpleasant to passengers. Several other large roads that are now using round manholes on their tanks are making the very desirable change to oblong holes.



DETAILS OF WABASH RAILROAD HOPPER TANK.

Bar *E* extends continuous to the top line of the second shell.

Bar *D* extends from top line of shell on either side, but is cut off within 6 inches of the bottom center, thus making an opening or gap of 12 inches.

Bar *E* extends continuous to the point in connection with bar *B*.

Bar *B* extends from top end of bar *E* to a connection with bar *D*, forming a water-tight receptacle between bars *B*, *D* and *E*, with the exception of the opening or gap in bar *D*, at bottom.

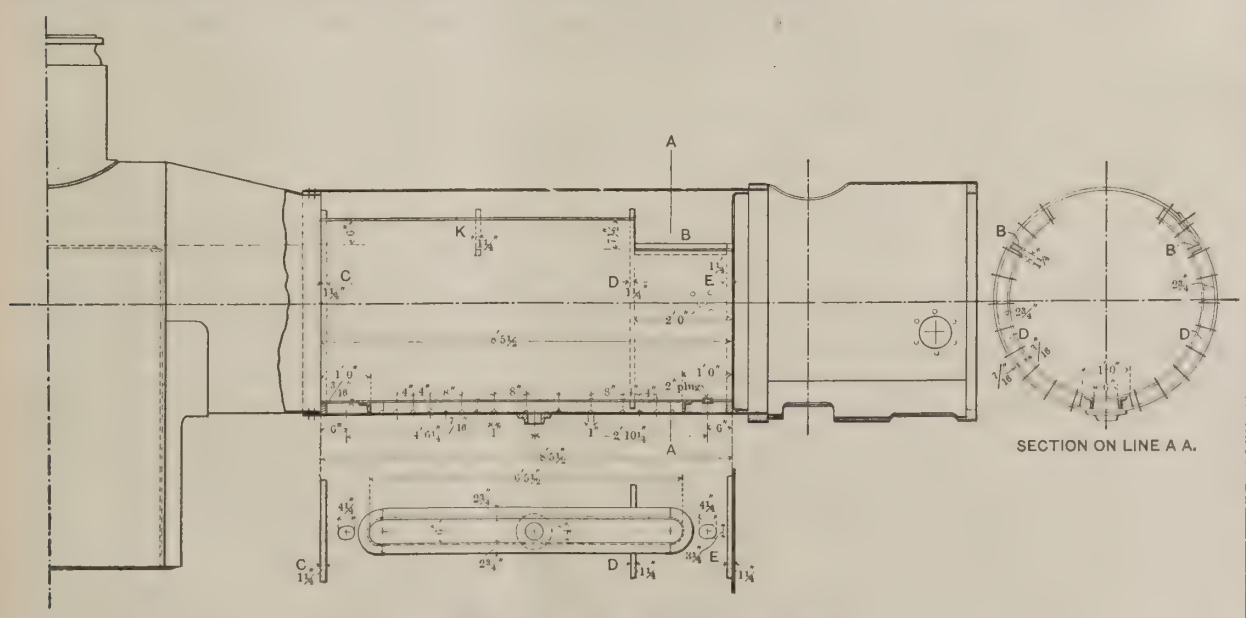
Bar *K* is simply a support for the inner shell.

A two-inch plug is placed on the inner shell immediately over the front hand-hole in the main shell, for the purpose of making examination and to wash the flues when necessary. Hand-holes are placed in the main shell between the ends of the angle iron and bars *C* and *E*, for the purpose of examination and to wash out between the shells when desirable.

A 2½-inch valve is placed near the center of belly of the main shell, and operated by a lever from the cab. Valves of similar make but of smaller dimensions are placed in the water leg immediately above the mud ring, and located one on each side, or on front and back leg, and operated from cab or running-board.

The operation of this device is as follows: The water enters through the ordinary check and is forced to pass down through the opening or gap in bar *D*, then rise to the top line of second shell before it enters the boiler proper.

In the meantime it is at a high boiling point, and the foreign solid matters are precipitated to the bottom along the angle iron-base and are expelled through the valve in the belly of boiler when desired.



BARNES' FEED-WATER PURIFIER.

The Barnes feed water purifier with which these engines are equipped is shown in the accompanying drawing. This device, patended by Mr. Barnes, consists of an intermediate or second boiler shell, flanged to fit between the main shell and the flues, being riveted with ⅝-inch rivets to the main shell through wrought iron bars or rings, 2¾ inches thick and 1¼ inches wide. This shell extends upward 6 inches above top level of the crown sheet, and as near the full length of the main barrel of the boiler as possible. The front end is fitted snugly against the flue-sheet, thus a water-tight receptacle is produced between the shells 2¾ inches by the full length of the inner shell.

By referring to the cut, it will be observed that the second shell is riveted to main shell through wrought iron bars, *C*, *D*, *E*, *B*, and brace *K*, and supported along the bottom by angle-iron 2¾ inches by 2¾ inches, which is riveted to second shell by ⅝-inch rivets.

Whatever vegetable or lighter substance succeeds in entering the boiler proper, finds its way to the mud ring, and is expelled through the valves placed for this purpose.

This device was referred to in the report of the committee of the Master Mechanical Association on "Purification or Softening of Feed Water," in 1891, as follows: "Five [roads] report now using the Barnes mechanical device with good results. As compared with other devices, the capacity is such that it disposes of the heavier solids and keeps the crown sheet clean and reduces greatly the accumulations in the boiler and water leg. The reports are unanimous in voicing the merits of this device for any and all classes of water. As a heater and circulator its capacities seem unquestioned."

As mentioned in our issue of April, 1892, the first engine equipped with this device was laid up for general repairs March 31 last after running for 26 months and making over 92,000 miles. The crown sheet and crown bars were found to be apparently as clean then as when the engine first went into service. The boiler had about three bushels of fine scale such as is usual in boilers that have had five or six months' service.

No perceptible wear of the purifier was noticeable, and no repairs were found necessary. During its service of 26 months it had cost nothing except for occasionally grinding in the valve of blow-off cocks.

Tests of Compound and Simple Locomotives.

Following are particulars of a test of compound and simple locomotives on the Southern Pacific. The tests were conducted on the mountain division between Sacramento and Truckee. Both were Schenectady engines with practically no difference in their construction except in the details of compounding.

The particulars of these tests are of some interest because the circumstances that attended them were somewhat different from the regular run of such tests. They are really the particulars ef two different series of tests which illustrate in a way the influence of management by the crew upon the economy of the engine.

The first series of tests, extending over six days and including three round trips over the Mountain division with each engine in freight service, was made at the same time by both engines, so that the conditions of wind resistance and temperature might be the same for both engines. The regular crew was on each engine. The crew on the compound were rather careless about the coal consumption of the engine, the fireman permitting frequent popping and the engineer offering no objection. The crew on the simple engine took every advantage of circumstances to save fuel and permitted absolutely no popping, avowing their intention of "beating the compound on coal." There resulted a saving of but two and a half per cent. in favor of the compound.

As the average of many former tests was much more favorable for the compound than this, it was evident that the simple engine had had very superior management. So it was decided to repeat the test with the compound engine in charge of the crew who had operated the simple engine so economically. This was done, repeating the test with the compound engine alone, and comparing its performance as below with the performance of the simple engine during the previous test. Three round trips were made during this test, and all the conditions maintained as nearly as possible as during the previous test.

	12-whl. Schen.	12-whl. Schen.
Description of engines	Compound.	Ordinary.
Cylinders	20 in. and 29 in. × 26 in.	20 in. × 26 in.
Diameter of drivers	51 in.	51 in.
Driving-wheel base	13 ft. 9 in.	13 ft. 9 in.
Rigid " "	9 ft. 2 in.	9 ft. 2 in.
Weight on drivers	109,750 lbs.	109,750 lbs.
Total weight in working order	139,000 "	133,000 "
" " of tender loaded	71,800 "	71,800 "
Capacity of tank, gallons	3,358	3,358
Heating surface in firebox, sq. ft.	155	155
" " " tubes	1,729	1,729
" " total	1,884	1,884
Grate "	30.86	30.86
Kind of coal	Rocky Mt.	Rocky Mt.
Date of test	Aug. 6 to 11,	July 18 to 23,
Where made	Sac. and	Truckee.
Number round trips	3	3
" of miles per round trip	239	239
Average number gallons water used per round trip	16,202	18,296
Average number lbs. coal used per round trip	22,555	25,976.666
Average number tons coal used per round trip	11.2775	12.9885
Average number cars hauled per round trip	12	12 ⅛
Average number tons weight of train ex. engine and tender	300.408	317.678
Average number gallons water used per trip per ton of train	53.933	57.593
Average number lbs. coal used per trip per ton of train	75.081	81.770
Average number lbs. water evaporated per lb. of coal	5.986	5.869
Average number miles run per ton of coal used	21.1926	18.401
Average steam pressure	158	158
Total locomotive miles	717	717
" lbs. coal used	67,665	77,930
" tons coal used	33.8325	38.965
" cost of coal on Sac. division	$211.79	$243.92
" tons weight of train hauled 1 mile ex. engine and tender	215,392.536	227,775.126
Total car mileage	8,604	8,723.50
Number lbs. coal used per locomotive mile	94.37	108.689
Number lbs. coal used per car mile	7.864	8.933
Number lbs. coal used per 1,000 tons weight of train hauled 1 mile	314.147	342.136
Cost of coal per ton of 2,000 lbs. on Sacramento division	$6.26	$6.26
Cost of coal per locomotive mile	$0.2954	$0.3402
" " " car mile	$0 0216	$0.02796
" " " 1,000 tons train hauled 1 mile	$0.98328	$1.07088
Comparative cost per ton train, 1 mile, Eng. No. 375 taken as 100%.	91 82%	100.00%

As shown in the table there resulted a saving of a little over 8 1/10 per cent in favor of the compound.

During this test the injectors on the compound engine gave some trouble. The engine had two No. 10 Monitor injectors, and neither could be adjusted to a sufficiently fine feed, while the speed would be slow in ascending the mountain, and there was considerable water lost through injector overflow because of the hose strainer becoming frequently stopped up with a stringy matter in the feed water. Had not this disadvantage existed it is probable the saving for the second test would have been close to 10 per cent. in favor of the compound.

Double-Hopper Gondola Car, Baltimore & Ohio Railroad.

The illustrations presented herewith show the general arrangement drawings of the standard double-hopper 60,000-pound capacity gondola car of the Baltimore & Ohio Railroad. The length of the car over end sills is 36 feet 2 inches, outside of end planks 34 feet 6 inches, and inside of end planks 34 feet. The width over side sills is 8 feet, and the height of side and end planks is 2 feet 10 inches. The depth of the hopper is 2 feet, and the openings are 2 feet 9 inches by 4 feet 9 inches.

SILLS.

The side sills are of yellow pine 5 by 10 inches and framed to the end sills with 1½-inch double tenons. These sills are mortised 1¼ inches deep to receive tenons of bridging, and ⅞-inch tie rods are located close to the bridging having cast iron washers under heads and nuts. The intermediate sills are 3 by 8 inches, yellow pine, framed to the end sills and bridging with 1⅛-inch double tenons, and are secured to the bolsters by ¾-inch bolts, which are put in place before the floor is laid and have cut washers under heads and nuts. Holes 1¼ inches in diameter are bored through the intermediate sills on angle, as shown in the sectional drawing through end, to receive the body bolster truss rods.

The center sills are also of yellow pine, and are 3½ by 9 inches, and framed to the end sills with 1½-inch double tenons, and are gained out 1 by 15 inches to receive body bolsters. They also have double mortises 1¼ inches deep on outside to receive tenons on bridging, and holes bored in them for ⅝-inch bolts to secure the sills to the center stringer, the bolts having cut washers under head and nuts.

White oak liners 2 by 3 inches are placed under sills between body bolsters and bridging, and two liners of the same material 2 by 7 inches are placed under center sills and center stringers, to prevent longitudinal motion of body bolsters, and secured with ⅝-inch lag screws. The bridging is of oak, 6 by 10 inches, and framed to side and center sills, as before described, and is chamfered off to receive the floor.

The end sills are of oak, 8 by 10 inches, and are mortised 1¾ inches deep to receive side and intermediate sills. They are straight at the center for a distance of 3 feet, and tapered to 5 inches at each end, and project over side sills 2½ inches, having ends chamfered all around half an inch each way, except on top, as the foot-boards project half an inch over the ends.

BODY BOLSTERS.

The body bolsters are made of three pieces of white oak 4½ by 6½ inches, and two pieces of iron ⅝ by 6 inches bolted together with ¾-inch bolts, having cut washer under head and nut. They are placed 5 feet from outside of end sill to center of bolster, and are gained 2 inches deep to receive side sills. An oak liner sufficiently thick to give ⅝ inches clearance between side bearings is placed between the latter and the bolster, and fastened to the bolster with three 12-penny nails.

The bolsters are trussed with ½ by 3-inch riveted truss rod strap forming a pocket to receive 1-inch truss rods with ends upset to receive 1⅛-inch nuts passing through intermediate sills and end of bolster. The truss rod strap is supported at center sill by truss rod stand, as shown in the drawing. The truss rods are tightened sufficiently to camber the bolster so as to allow ⅝ inches clearance between truck and body side bearings.

TIE TIMBERS.

The tie timbers are 5 inches by 10 inches oak, gained out 1 inch deep to receive the side sills, and chamfered between side and center sills to receive the inclined hopper floor and secured to the side and center sills by ¾-inch bolts. Four body truss rod stands are secured under each tie timber with two 5-inch lag screws in each stand, and the timbers are also cut out to receive the continuous draft rods as shown.

HOPPERS.

As shown in the illustration the car has two hoppers. Each hopper has four slings of 1 by 3 inch iron which are lipped over the side sills and secured to same by ¾-inch bolts. The large hopper slings have one ⅞-inch rod, each passing up through center stringer as shown, and have a cast iron washer under the head, and double nuts under the slings.

The hopper doors are made of one piece of white oak 1¾ inches thick, 16½ inches wide and 5 feet 4 inches long, and are secured to the hinges with ½-inch button head bolts with the head on the inside and single nuts under the hinges.

The hinges are made of ⅝ and 2½ inch iron. There are three on each door and three on each side of hopper opening, all of which are secured to the hopper by ⅝ and ½ inch button head bolts, with single nuts and cut washers. Iron rods, ¾-inch in diameter, pass through the door and hopper hinges. The hopper winding arrangement is applied to the car body with two 1¾-inch shafts, one located at each hopper, as shown in the general arrangement drawing. These shafts are squared on one end, to receive the ratchet wheel, and secured at the other end with a flat key. Chafing strips, ¼ inch by 2 inches, are placed on the side and center sills to prevent the shaft from chafing them, and ¼-inch wrought iron plates are secured to the sides of the car with ½-inch lag screws, to prevent the ratchet wheels chafing the car body. The pawl is secured to the plate and side planks with a ⅝-inch bolt, and the keeper is fastened with ½-inch lag screws. Half-inch chains are secured to winding shaft by ½-inch bolts, which have double nuts, and to ⅝-inch door chains with ½-inch ring. The door chains are welded into ⅝-inch eyebolts, which pass through the doors and have double nuts.

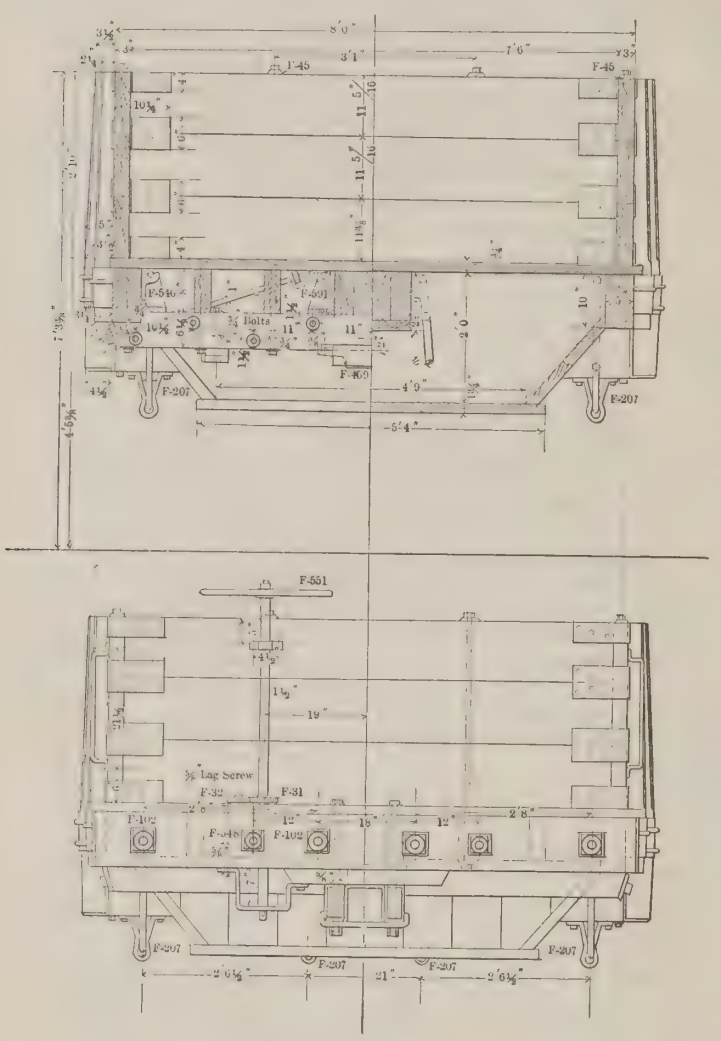
FLOORING.

The flooring is of oak 1¾ inches thick finished. It is laid crosswise and extends ½ inch over the side sills. Each board has three 20-pennyweight nails in each timber, and the incline hopper boards, as before mentioned, are fastened to the hopper slings with ½-inch button head bolts

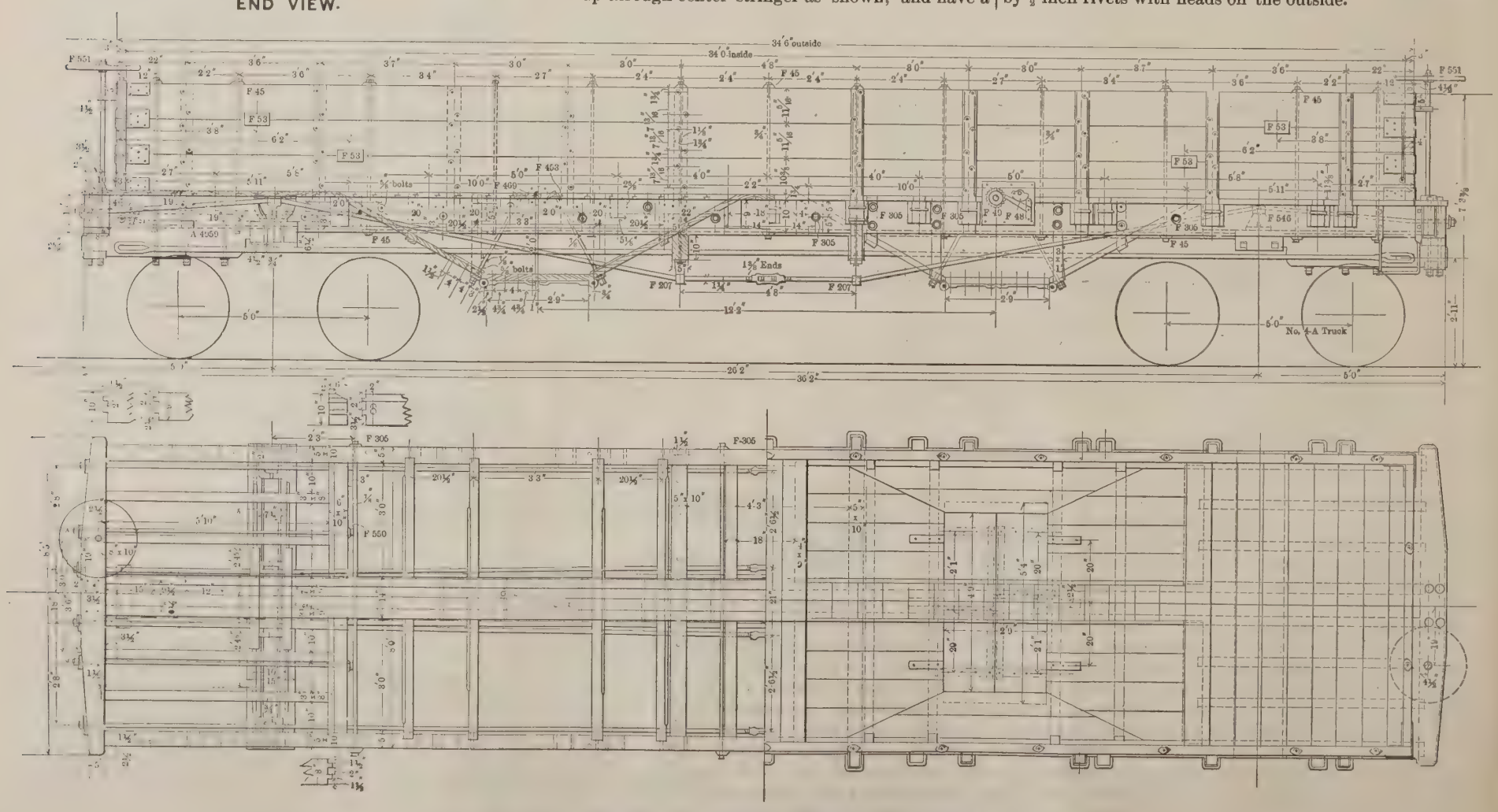
The hopper trap doors are made of white oak and are finished and laid to correspond with the floor of the car body. The trap doors have two 1¾ by 6-inch battens securely nailed to each board with clinch nails. Each car has eight of these doors, four at each hopper opening, and they are finished flush with the top of the floor.

SIDE AND END PLANKS.

The side and end planks are of yellow pine 3 inch thick, 34 inch high and of three pieces—two pieces 11 5/16 inch, and one piece 11⅛ inches wide. The side planks are 34 feet 6 inches long, and are laid on top of floor and furring. They are secured to the side sills by ¾-inch bolts, with a cast iron washer on top of side plank and single nuts on under side of sill. They are also bolted to ten white oak stakes on each side of the car by ½ inch bolts. Eight of these stakes on each side are 3½ by 4 inches, and extend down to bottom of side-sill, and two stakes at each side are 4 by 5 inches and extend down to bottom of tie timbers. All stakes are neatly finished and chamfered as shown in the drawings, and are fitted in pressed steel pockets secured to side sills by ¾ inch round iron pocket yokes. The bottom side planks are cut out 1 inch at center, tapering toward the ends to allow camber of the car. The end planks are 7 feet 6 inches long, and are secured to the intermediate sills with ¾-inch bolts. The end and side planks are secured together by eight pressed steel corner-bands, at each corner, placed on the outside and inside of planks, and neatly riveted to place by ½ inch rivets with heads on the outside.



END VIEW.



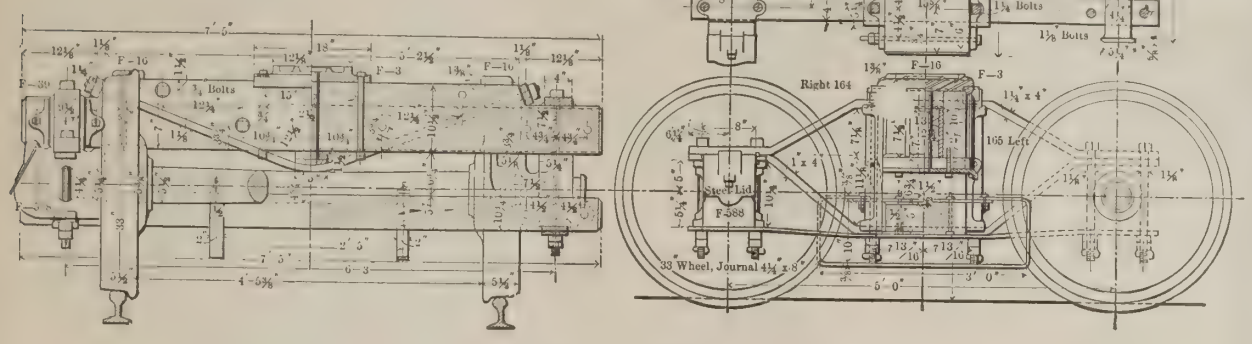
BALTIMORE & OHIO R. R. DOUBLE HOPPER GONDOLA CAR.

The American continuous drawbars are standard for these cars.

TRUCKS.

The trucks are so well illustrated by the drawings presented herewith that description is almost unnecessary. They are the standard trucks for 60,000 pounds capacity cars on the Baltimore & Ohio Railroad, and are of the rigid diamond pattern. Both trucks under these cars are equipped with inside brakes that may be handled by the usual arrangement at either end of the car. The National Hollow brake beams are used on these trucks.

The truck bolsters are of the compound type and made of three pieces of white oak, the outside pieces being 3½ inches by 10½ inches and the center piece 6 inches by 10½ inches, and rabbetted to receive ⅝ inch by 7 inch plates. They are bolted together with ¾-inch bolts and are 10½ inches deep by 13 inches wide by 7 feet 5 inches long. As shown in the drawing they are



Truck for 60,000-Pounds Capacity Car, B. & O. R. R.

gained on each end, leaving 7½ inches depth of timber, thus forming an angle shoulder to receive a 1¼ inch by 3 inch truss rod washer. The spring plank is 13 inches wide by 5 inches deep by 7 feet 5 inches long, and is gained 1 inch deep at 6 feet 3 inches centers to receive inverted arch bars. Fulcrum bar chafing plates ¼ inch by 2 inches by 5 inches are secured on the spring planks with countersunk head screws directly under fulcrum bars to prevent the latter from cutting the spring planks. The journal boxes have pressed steel lids of the Morris pattern, which are made to fit the boxes neatly and are secured by ⅝ inch turned pins passing through a $\frac{21}{32}$ inch hole in the lug of the box.

PAINTING.

The outside surface of the woodwork of the car body is painted with three coats of mineral brown paint. Pure white lead is used in lettering, numbering, etc. One coat of mineral brown paint is given the inside of the car body. All side and end planks are painted where joined together; also the edge resting on the floor.

All ironwork outside and underneath the car is given one coat of asphaltum. All wood used in the construction of the trucks is given two coats of mineral brown paint.

Boilers for High Pressure Locomotives.

Following is the report of the Committee of the Master Mechanics' Association on boilers for high pressure steam in locomotive service. The report was rendered at the June convention, but the drawings referred to were received too late to be engraved and appear in the report. Delay in having the engravings completed necessitated withholding the report from appearance in these pages until the present.

Your Committee on "Boilers for High-Pressure Locomotives" concluded, as the number of roads using high-pressure steam on their locomotive boilers was limited, to request the information regarding boilers of this class (the Belpaire included), direct from the (motive power) officers of these roads, in preference to the usual method by circular. The following gentlemen have complied with our request:

Mr. F. W. Dean, mechanical engineer writes: "The Old Colony compound locomotive carries 195 to 200 pounds of steam and has been running every day since Nov. 4, 1891, making thirteen weeks of continuous service. We do not see any reason to suppose that it is going to be troublesome as to its boiler. There is no evidence that the boiler has a heavy pressure except by the indication of the steam gage. Personally, I should never think of using any boiler but the "Belpaire" for high (or low) pressure."

Mr. Wm. Garstang, Superintendent of Motive Power, Chesapeake & Ohio Railway Company, writes:"I wish to call your attention to two types of boilers used on this road, carrying a maximum pressure of 165 pounds per square inch. The wagon-top boiler is used in a number of 19-inch by 24-inch cylinder 8 wheel passenger engines, also in quite a number of 19-inch by 24-inch cylinder 10-wheel freight engines. The Belpaire boiler is used in 21-inch by 24-inch cylinder consolidation engines.

"So far as the boilers themselves are concerned, I have not experienced any objectionable features, or increased repairs to same on acount of high pressure, but have, however, noticed that the cylinders and steam pipes work loose more frequently on these engines than on engines carrying 140 pounds pressure and less. Have also noticed that driving-boxes, main and parallel rod-bearings wear more rapidly. In fact, I believe all working parts do, more or less, but I cannot say to what extent, as we have not kept an itemized account of same.

"We have thirty-four locomotives with Belpaire boilers. I have yet to receive the first complaint about any of these boilers carrying water badly, while on the other hand, a great many of our engineers prefer them to the wagon-top boiler in that respect, and all agree that they steam much more freely."

Mr. H. J. Small, Superintendent of Motive Power and Machinery, Southern Pacific Co., writes: "The only engines we have carrying high pressure (that is, 180 pounds boiler pressure) were recently received from the Schenectady Locomotive Works. We have not yet made drawings of the boilers. The engines referred to are compound, and for this class of engine I consider that there is no question but that high pressure steam is beneficial. Have had no experience with the Belpaire boiler. Would say, no objectionable features have developed in the use of high-pressure steam in the engines above referred to."

Mr. C. E. Smart, General Master Mechanic of Michigan Central Railroad Co., writes: "I am not in a position to give you much information or an opinion of much value on the subject, as we have but two engines in service that are carrying 180 pounds pressure, but have quite a number of 10-wheelers that are carrying 165 pounds.

"As regards any objectionable features that have developed from increased pressure, or as to whether increased pressure has necessitated increased repairs, I can only say that so far we have experienced no particular difficulty, but we have not been using the high-pressure long enough to have developed any particular defects, and for that reason I do not feel that the information that I have to give would be particularly valuable on this point.

"As to the merits of the Belpaire boiler for carrying high pressure, I should not wish to express an opinion for the reason that I have had no experience with that type of boiler, but I feel free to say that I am not very favorably impressed with this type of boiler as having any great advantage over the ordinary form of boiler with crown-bars or with radial-stays.

"As regards the construction of boilers for extreme high pressure, there are different ideas among men as to the form and construction of joint for longitudinal seam, and I believe that it is considered the butt joint, with inside and outside welt strips, to be preferable to lap joint with inside welt-strip, and it is my opinion that in extreme high pressure the butt joint would be preferable. I believe there is a great advantage in double riveting the mud-rings, as in boilers so constructed we have had less trouble with leaks at mud-ring than the single riveted mud-ring, with which it is very difficult to keep the mud-ring tight, especially at corners. Another advantage with double riveted mud-ring—if there is any pressure tending to force the inner firebox down, the double riveting is certainly of great advantage."

Mr. J. H, McConnell, Superintendent of Motive Power and Machinery, Union Pacific system, writes: "Am much interested in this subject as we are now preparing to build some boilers to carry 180 pounds of steam. Have given the matter considerable thought and would very much like the views of other people on this subject. We have a 10-wheel engine boiler now under construction, 64-inch shell, 8-foot firebox, with radial stays, using 9-16-inch steel for shell, 5-8-inch throat-sheet with 280 2-inch flues. Have also a boiler under construction for an 8-wheel engine, 60-inch shell, 250 2-inch flues, 9-16-inch steel throughout, with radial stays. Would prefer iron for boilers throughout, provided it could be obtained of as good quality as steel, but, as the iron manufactured now is liable to blister and the sheets split, think steel is the best material."

Mr. A. B. Underhill, Superintendent of Motive Power, Boston & Albany, writes: "We built our first high-pressure boiler in 1880 and since that year have built 118 of them. We built them the same form and design as the low-pressure, but stronger; plates thicker and more strongly stayed. They have given us perfect satisfaction, there being no more repairs or failures than formerly. We carry 160 pounds pressure on them. Have had no experience with the Belpaire boiler."

Mr. W. H. Thomas, Superintendent of Motive Power, East Tennessee, Virginia & Georgia Railway, writes: "We have three high-pressure boilers in service. These are of the radial-stay wagon-top type, carrying a pressure of 180 pounds, and tested to 200 pounds. These boilers have been in service one and a half years, and so far have not failed in any particular. Our reports of staybolt examinations show that none of the radial staybolts have been broken or renewed. Have had no experience with the Belpaire type of boiler and can therefore say nothing in regard to it."

Mr. Pulaski Leeds, Superintendent of Machinery, Louisville & Nashville Co., writes: "We are not carrying steam to exceed 160 pounds. I find, at this pressure, we have more broken staybolts near the top of firebox, and at both forward and back upper corners, than we ever did with lower pressure on the old wagon-top class of boiler with crown bars. Will also say that, with the 62-inch shells and firebox 120 inches long, we have a great deal less trouble in every way from the use of the Belpaire boiler than any other type. In fact, I consider this the only proper form of boiler for a long firebox and large shells, inasmuch as, while one flat surface has to be tied, there is no reason why two may not be tied, and it can be a great deal more securely done than by any system of radial staying where the roof-sheet is in the form of a circle. Another thing: There is an excessive strain on staybolts near the top of the firebox at what might be called 'the base of the arch' formed by the shell; as we have not only the strain, caused by the steam between the two surfaces formed by the inside of the outside shell and the outside of the firebox, but also the strain caused by the tendency of the circle to straighten itself. In other words, the tying of the heels of the arch together as against the pressure above the crown-sheet. I claim we would have excessive pressure on the top and second row of staybolts, even if we made steam-tight joints level with the top of crown-sheet and allow no pressure below it. Of course this is not in exact ratio of the difference between the areas of the outside and inside sheets, or rather shell and crown-sheets, as radial-stays to some extent counteract the difference of pressure, but the way I look at it is, that if the circle of the outside shell were continued until united with the outside of the firebox and the stays taken entirely out, and pressure applied, the shell is just as strong as any other part, unless at the point of juncture of the shell-sheet with the firebox. There would be the point of rupture, and this same theory holds good as to the strain that is put on the upper row of staybolts in just the same degree, as the radial-stays fail to tie the entire arch and the space between the lowest row of radial-stays and firebox stays. I claim that the tendency to break these upper staybolts is increased, over and above the direct pressure as between these two sheets in the water-space, in direct ratio with the strain on the side-sheets acting to straighten the outside sheet.

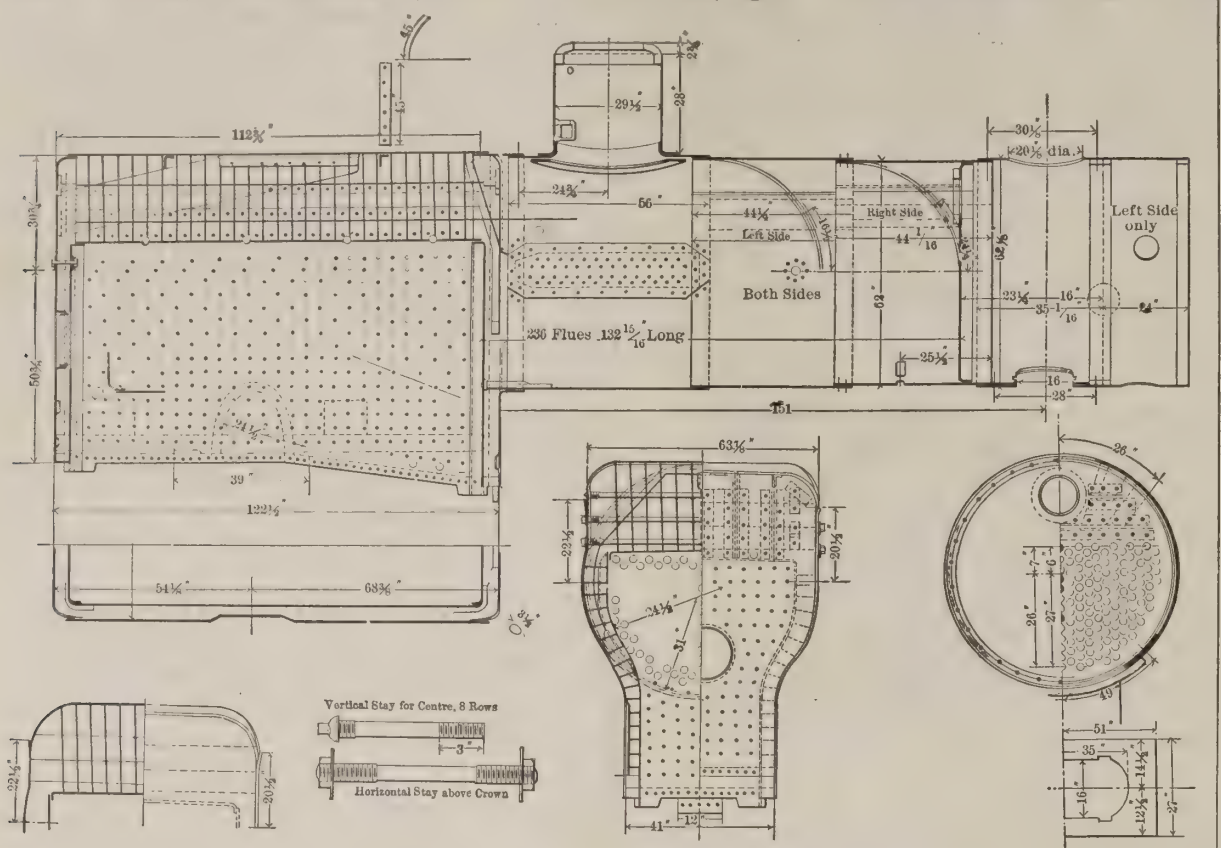
"I have seen a good many radial-stayed boilers that were continually breaking the upper row of staybolts, and that had pulled out the radial-stays near the sides. In my opinion this was caused by the fact that they not only had to withstand direct pressure of steam, but also the strain that would be put on, we will say a 1-2 inch square bar of iron bent to the form of the outside shell. If pressure representing the boiler tension was applied to this bar and at the same time it was pulled from each end, the forces would have a tendency to straighten it at the concave point looking from the outside.

"It is nearly, if not quite, impossible to put heads on the inside of crown-sheet on the two or three outside rows of crown-stays, and I do not consider any crown-sheet securely stayed unless it has such heads, so that in case the sheet stretches or buckles in any way so as to draw the hole to a size larger than originally threaded, the tendency to pull out will be resisted by something besides threads or slight riveting, as most of them are.

Mr. Reuben Wells, Superintendent of the Rogers Locomotive and Machine Works, writes: "We have built fourteen engines for the Chesapeake & Ohio Railroad Company about eighteen months or two years ago, all to carry 170 pounds working pressure. Ten were consolidation engines 21-inch by 24-inch cylinders, boilers 62 inches diameter at smokebox and were of the Belpaire type. Four engines were 10-wheel passenger, 20-inch by 24-inch cylinder, boilers 62 inch diameter at smokebox. These were radial-stay boilers, wagon-top raised 6 inches, back end and connection ring were a true circle. We built five 10-wheel passenger engines this size and type of boiler for the Louisville & Nashville Railroad Company some twelve months ago, which also carry 170 pounds pressure. Last fall we built twenty-two consolidation engines with Belpaire boilers, 62 inch diameter at smokebox to carry 170 pounds working pressure. For the Illinois Central, we built one pusher—consolidation engine—for the Nashville, Chattanooga & St. Louis, 22-inch by 24-inch cylinders, 66 inches diameter of boiler at smokebox, Belpaire type, to carry 170 pounds working pressure. We have also built wagon-top boilers to carry 175 pounds working pressure, some lately, for the New York & New England Railroad, etc.

"For several years past 160 pounds was the usual pressure specified by our customers, but lately the figures have been higher by some roads—up to 180 pounds, as stated. My opinion is, for large boilers, say over 60 inches diameter at smokebox, the Belpaire type, if properly made, is decidedly the safest boiler for high pressure, and the radial-stay type next, and the crown-bar boiler the most unsafe of the three, for large engines and high pressure. This conclusion applies only to the firebox and boiler shell around it. The cylinder part of the boiler is, of course, about the same in all types. The long span of the crown-bars in large boilers of that type renders sling-stays necessary to help bear the strain, and the uncertainty—I might say impossibility—of adjusting these sling-stays, so that each one of them will always have its theoretical share of strain and no more, renders that type of boiler unreliable. It may be all right and it may not; you have no means of knowing its strength of bracing except by a test pressure. You may know what that was as put on, but are not sure but what something would give way if the pressure was run up a few pounds above the test. There is no solid base to figure from in the bracing and staying of such boilers at the firebox. The radial-stay type is good, and so far I have not heard of any failures in the crown and wagon-top staying. The angular direction of many of the stay-rod holes through the sheets is an objection, but if well made there is ample strength in that part of the boiler. Eight or ten rows of the crown stay-rods should have button heads under the crown-sheet, so that in case of low water there would not likely be an explosion from

the sheet pulling off these bolts. At any rate, the heads lessen very much the risk. The Belpaire boiler, however, by its shape, admits of a very close calculation of just what the strains are which have to be sustained by the different rods, stays and bolts—that is, there is something tangible to figure from, and if the designer of such a boiler will figure out the strains on all the parts about the firebox and of the boiler and then proportion the bracing accordingly, there need be no 'weakest spot.' We have within the past year built for the C., B. & Q. Railroad 33 engines with Belpaire boilers, and have 40 more to build of the same type. Also, two more for the Illinois Central. This type seems to be gaining in favor over all other types, and deservedly so, I think."



Belpaire Boiler for Rogers Locomotive.

The Brooks Locomotive Works furnished your Committee with blue prints of three types of boilers which they are building to carry 170 to 180 pounds pressure. These boilers were designed to meet the views of their customers—two wagon-top (one deep, and the other shallow firebox) and one Belpaire.

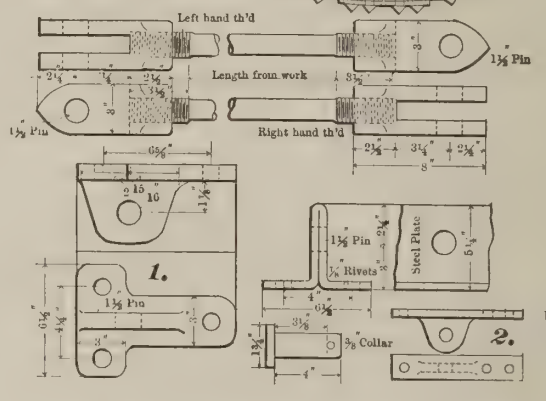
In the construction of the Belpaire, shown in Figs. 1 and 2, for 12-weel engines, the crown-sheet of firebox is slightly arched and supported by radial stays, screwed through crown-sheet and wagon-top, the stays having nuts below and riveted on top. The sides above crown-sheet are supported by three rows of cross-stays, with wagon-top sheet lapping far enough to take two rows of cross-stays. The-center row takes the wagon-top side-sheet and a re-enforcing sheet which extends down far enough to take the three upper rows of firebox stays. The back-head sheet is re-enforced with four angle-irons backed together in pairs. There are twenty-eight stays in the back head, eight of which run to the front sheet of the Belpaire top, twelve to the front flue-sheet, and eight to the second course of the barrel of the boiler. The front of flue-sheet is re-enforced by a fish-belly angle iron, which carries two braces back to the end of first course.

Fig. 2.

Fig. 3.—Radial Stayed Boiler for Pittsburgh Locomotive.

Dome 31 inches in diameter; hole in barrel 21 inches diameter is re-enforced with a collar of 50 inches, outside diameter, by 5-8 inch thick, and five rows of rivets through collar; tow rows take the dome flange, two outside and one inside of dome. Mud-ring double riveted.

The Pittsburgh Locomotive Works furnished a blue print of boiler, Fig. 3, designed to carry 180 pounds pressure. Also blue print of method of making butt joints. The factor of safety in this boiler is 4.8, and joint used is one shown at right upper corner of print and has six rows of rivets. The flanged sheet T braces, riveted to back head and front flue-sheet, are calculated to be strong enough as a beam, to carry the load upon them when supported by the top flange and the braces at the bottom.



Butt Joints, Pittsburgh Locomotive Works.

We have also a blue print of a boiler of the Belpaire type, built by the Pennsylvania Railroad, for their class "O" engines, designed to carry 175 pounds pressure. [See page 23, NATIONAL CAR AND LOCOMOTIVE BUILDER, February, 1892.] They are now building almost exclusively the Belpaire type of boiler and claim it is the best design, that the plan of staying flat surfaces to each other is the true

one and gives the best results. The design of the other boilers used by this company is similar to this one. The outside shell-sheets are the same thickness as the firebox. This is a departure from the usual practice. The idea is to make both sheets of equal flexibility so that the strains due to vertical expansion of the firebox sheets will not be concentrated next to the outside sheets, which is the case when this sheet is thicker and consequently stiffer. The staybolts at top of firebox are longer than in general practice. The departure is a good one, the increased length reducing the tendency to break. It will be noticed that the crown-stays project through the sheets and have nuts on them. The two front and two back rows of crown staybolts are made flexible by nuts and ball joints. This arrangement is to relieve the strain and tendency to buckle these rows of bolts. The method of fastening dome to shell is a departure from the usual practice and is a good strong device.

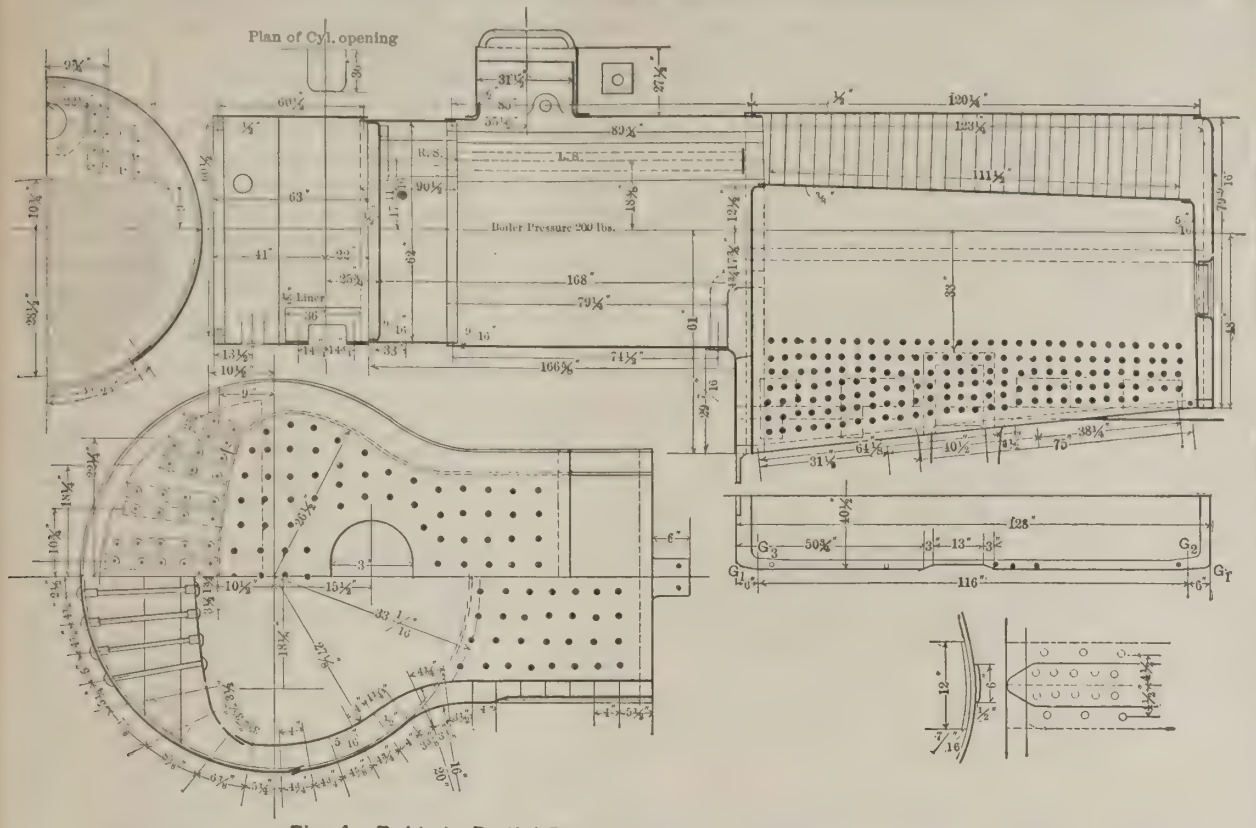


Fig. 4.—Baldwin Radial Stayed Boiler for 200 Pounds Pressure.

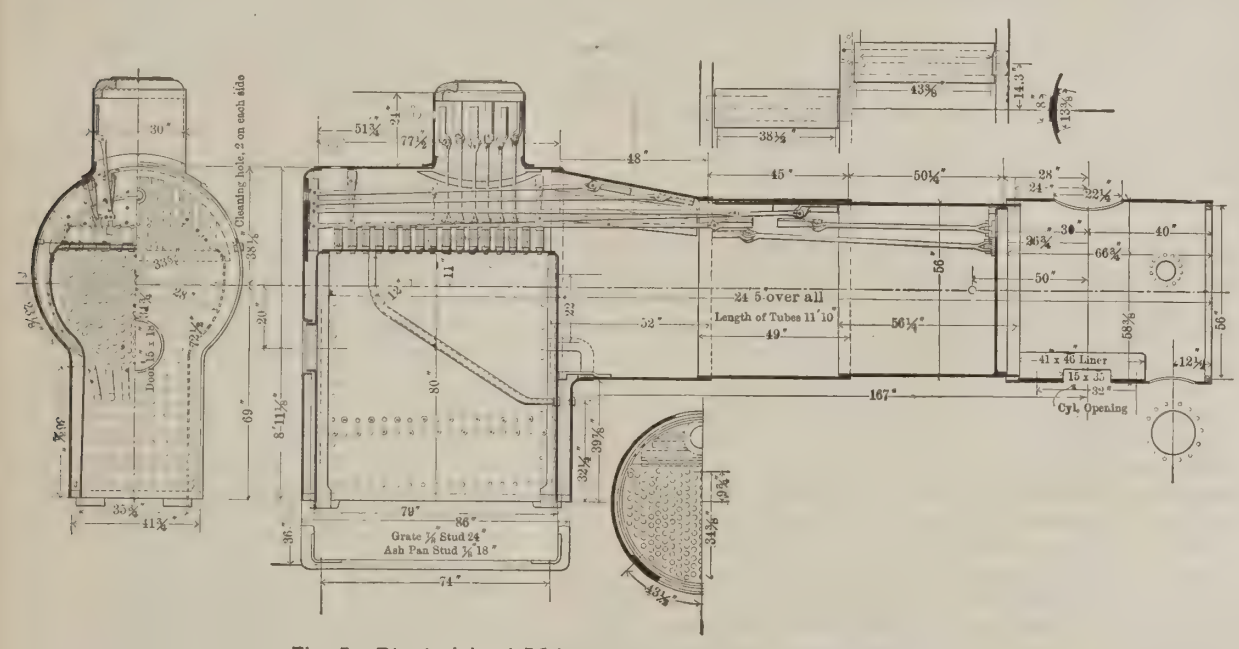


Fig. 5.—Rhode Island 56-inch Boiler for 180 Pounds Pressure.

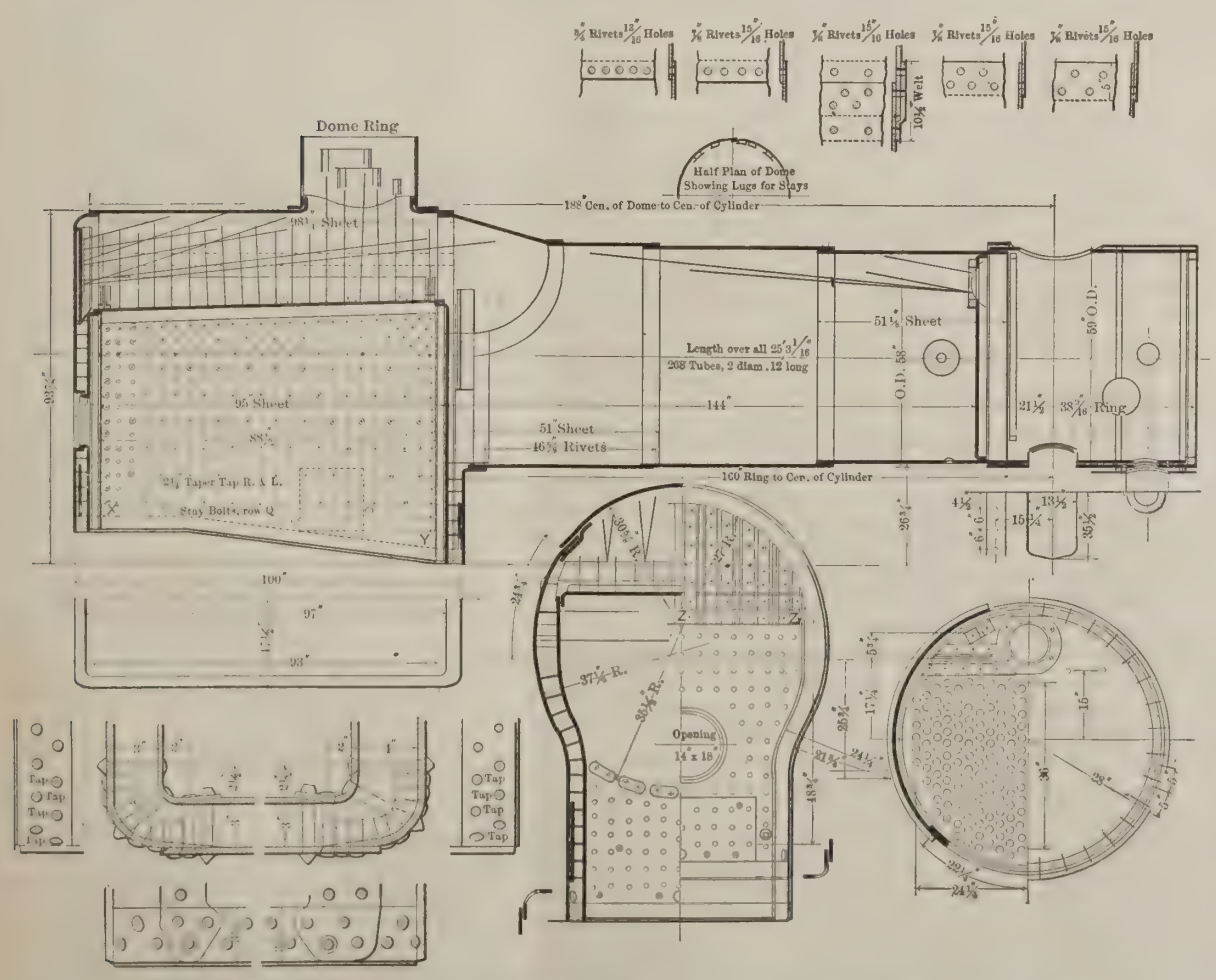


Fig. 6.—Schenectady Boiler for "Empire State Express Engines." To Carry 180 Pounds Pressure.

The Baldwin Locomotive Works furnished a white print of one of their standard type of boilers for carrying 200 pounds to the square inch. Fig. 4.

The Rhode Island Locomotive Works furnished a blue print of a 56-inch wagon-top boiler, Fig. 5, designed to carry 180 pounds pressure. The only change they make is, to arch the crown-sheet about 1 1-2 inch.

The Schenectady Locomotive Works furnished two blue prints; one radial-stayed boiler with extension wagon-top now on Michigan Central Railway, No. 338, a ten-wheel compound passenger on fast trains from St. Thomas to Windsor. The print, Fig. 6, for 19-inch by 24-inch cylinder passenger, is for N. Y. C. & H. R. R. R. for fast passenger service. These boilers are running the "Empire State Express" carrying 180 pounds pressure.

Your Committee was somewhat at a loss to know what constituted high pressure on a locomotive boiler. It is not long since that 150 pounds was considered high. This has become common. We therefore concluded to call anything in excess of 150 pounds high pressure. Your Committee has not obtained much information as to the action of these boilers in service, because it is of a comparatively recent date that such high pressures have been used, and most of the boilers being so new they probably have not given much trouble. We are under the impression that trouble will develop with broken staybolts at top of firebox in all types of boilers. This trouble can be mitigated by increasing the length of staybolts at that part of the boiler by reducing width of firebox at top. Some of the tubes would have to be left out, but this would be offset by increased life of staybolts and freer steaming. The reduction of transverse strains in staybolts obtained by increasing their length is much greater than is generally supposed. The reduction of width of water space, consequently length of staybolts at top of firebox, is exceedingly bad practice. The double riveting and increased size of mud-ring to resist the downward pressure of firebox is important on all high-pressure boilers. The radial-stayed boiler is coming into more general use and has been found to be a strong, reliable boiler. The objection urged against the angles of the stays and difficulty of keeping them tight has not been found valid in practice. If the holes are threaded in outside sheet with a short tap, then threaded in crown sheet, instead of both holes at same time with one long tap, and the stays enlarged at points where they nt in sheets, and thread cut on there, there will be the same thread but from different starting points, and trouble with leaking and loose stays.

Your Committee have knowledge of fifty radial-stayed boilers, with stays riveted over outside and inside, that in seven years have not found a broken stay in the crown-sheet or trouble from sediment collecting. Staybolts have broken on side-sheets, but not more than on boilers with crown-bars on fireboxes. It looks as though the radial-stayed and Belpaire-type were the coming boilers. The Belpaire is not so well known as the other, but its merits will soon be understood and appreciated. The Belpaire boiler costs about $150 more to manufacture than the ordinary boiler. The butt-joint has been generally accepted as the best, though the covering-plates make a resistance to the boiler retaining true circular shape in expansion. The ideal boiler is one without joints, but as we cannot have that, we should have as few joints as possible. Waist or cylinder-part of boiler should always be made in one sheet. Outside shell of firebox could also be one, and when radial stays are used inside-sheet could be a single one. The blue prints accompanying report show the most advanced construction of the different types of boilers for high-pressure steam and are worthy of close study.

Jas. M. Boon, H. D. Gordon, J. S. Graham, J. H. McConnell, Committee.

On motion the report was received.

Mr. H. D. Gordon: It is only quite recently that it has been the practice to carry excessively high pressure—in fact, only since the advent of the compound engine. One thing is well settled and that is the old crown bar type has about gone out of use and the radial stay and the Belpaire type seems to be the most in favor. The point has been raised that with a radial stay boiler, the stays not going through the sheets in the right angles, good threads cannot be had. But that is not sustained in service. There are hundreds of radial stay boilers running to-day that are doing well and giving no trouble. The Belpaire type has advocates, principally from the fact that the flat surfaces can be stayed directly to each other. Perhaps the most troublesome thing about a boiler of exceedingly high pressure is the matter of broken staybolts. We know that this occurs principally in the top rows. The best remedy I know of is to make the top rows longer. I do not think that in the past the practice has been good in that respect, and I think it is becoming more generally appreciated that the longer you get the top bolts the freer you are from breakages.

Mr. Lauder: I have used for eight years pressures ranging from 170 to 190 pounds, and careful designing, good workmanship and good material must be used to stand these enormous pressures. The fewer longitudinal seams we have in a boiler the better.

Mr. Vauclain: We manufacture in the neighborhood of 1,000 boilers every year. I think it would be well to turn down all staybolts between centers. If one boy can handle a machine that will cut eight staybolts at one time, I do not see why anybody should question the expense of doing it. You may pursue any method you please to make the bolt, so long as you use the proper material. If you take steel that is high in tensile strength it will stand more vibrations. So it is with staybolts. I believe in using an iron for this purpose as hard as you can get it. We use an iron of tensile strength from 50,000 to 52,000 pounds, from 20 to 25 per cent. elongation in an 8-inch section.

Mr. Reuben Wells: The diameter of the staybolt should be proportioned somewhat to the thickness of the sheet through which it passes; that is, a seven-eighths bolt will break sooner when it is put through a half sheet than it will through a three-eighths sheet, for the reason that the thicker sheet is so stiff that the expansion of the inside sheet, when it forces the bolt out of its original position, the bolt itself must spring; while if it is a large bolt in proportion to the thickness of the sheet, the sheet itself will give somewhat in the direction of the strain, and thus relieve the staybolt. Another matter tending to increase the life of the staybolt is, to increase its length. The longer the bolt the longer its life will be, other things being equal.

The construction of the Chicago & St. Louis Electric Railroad was begun Aug. 15, at Edinburg, Ill. The President says the work will be pushed, and that the line will be in operation in a few months. The road, as surveyed, makes a bee line between St. Louis and Chicago.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

PLAIN AND COMPOUND LOCOMOTIVES.

Particulars of a test of compound and simple locomotives given on another page in this issue show a somewhat smaller saving in favor of the compound than is usual in reports of such tests. The tests were made on the Southern Pacific, and care was taken to have all the data accurate. The coal was weighed upon the tank with scales at the various coaling places, and the water taken was measured by means of water glasses on each side of the tender. The height of the water in the boiler and the condition of the fire in the firebox were equalized at the end of trips to correspond with the same at the start. The same crew operated both engines, so that there could be no difference due to different methods of firing and running.

The compound was at some disadvantage in having slightly lighter trains than the simple engine, and in the inability of the injectors used to be adjusted to a sufficiently fine feed during slow, heavy work on the mountain. These two circumstances vitiate the results of the test in an immeasurable degree, as it is simply guess work to say that either or both affected the economy of the engine one or two per cent. The kind of work done, hauling a heavy train up a mountain grade, was favorable to the compound. There are no particular conclusions to be drawn from the test, it being simply an instance in which the compound did not come out even ten per cent. ahead of the simple engine; although the work done, the methods of management and the influencing dimensions of the engines were all alike.

It is but fair to say, however, that the Southern Pacific officials have concluded from a large number of careful tests that the economy effected by their compound locomotives over simple engines doing the same work approaches 15 per cent. With coal costing $5.25 per ton this will make a very respectable saving, and will certainly justify roads using even much cheaper fuel continuing the purchase or construction of compound locomotives. Their wide use on European railways where matters of fuel economy have always received more attention than in this country, and on the railways of South America where fuel is very expensive, indicates to the unbiased that there is an enduring economy in compound locomotives, and that the increase of their number will continue on North American railways, where the fuel economy that may be effected by their use is considered of more importance than the cost of necessary additional repairs.

There is one thing that militates against the more rapid introduction of compound locomotives in this country and the sooner it is recognized the better, and that is the frequently exhibited unfairness in the claims of its advocates. Mr. Forney described the situation exactly when he said at the last Master Mechanics' Convention that "In nearly every instance the compound engine advocates ask for odds in their favor." Mr. Setchell drew a deserved and cutting caricature of the case when he arose at the same convention and dryly said: "We are constructing a compound locomotive and we expect by giving an increased heating surface, a much larger boiler, and all the other advantages which we can over the plain engine, to show a saving."

Compound locomotives that possess one or two hundred more square feet of heating surface, larger driving wheels, and that carry thirty or forty more pounds of steam pressure in their boilers than simple engines with which they compete, are unfairly favored in tests purporting to show the economical advantages of the principle of compounding. Such tests prove nothing for compound locomotives, but when they are held up to intelligent mechanical men as demonstrating the merits of compound over simple locomotives their effect is to engender distrust, the result of which is a bar to the adoption of the compound. Compound locomotives possess enough of legitimate advantages in economy and cleanliness to insure their final adoption where they are wanted. Efforts to intrude them or to attribute to them undue merit will only retard their advancement.

As the building of simple locomotives is not likely to be soon suspended, and as the thirty-four thousand simple engines already built and running upon our railways are not soon to be changed into compound engines, we may profitably turn our energy with undiminished zeal to the improvement of the simple locomotive in order to make it more economical. There is yet room for considerable improvement.

THE BUFFALO STRIKE.

August was not very far behind July in the prominence of its labor troubles and riots. Striking messenger boys in cities, girls in factories, boiler makers in railroad shops, rioting miners in Tennessee and striking and rioting switchmen at Buffalo and vicinity, have held the attention of the country for the past month. The strike of the switchmen on all the roads entering Buffalo was inaugurated at midnight, Aug. 12, by the burning of over a hundred freight cars, derailing trains and other wanton acts of violence. Their course of procedure was that of insane men, and their cause was doomed from the inception of the strike because of the destruction of property and violent acts committed. As usual in such cases the officers of the strikers union declared that the railroad companies burnt the cars, and that the strikers were innocent of the acts of violence committed. Many strikers were caught in the act, however, of assaulting non-union men, stoning the State troops sent to preserve the peace, and attempting to wreck passenger trains at night by misplacing switches and placing obstructions on the track.

The recent savage outbreaks of organized labor must be deplored by those who have admired the respectability of American workmen, and by those who have believed the various labor organizations accomplished much good in bettering the condition and elevating the character of their members. The principles proclaimed by such unions are generally very praiseworthy, and if they were seriously impressed upon the members and adopted by them as guides for their daily actions great good would certainly be accomplished. But such acts of violence as are witnessed in nearly every strike in which such unions become engaged indicate very strongly that the principles they claim to be guided by are empty shibboleths.

That this is true, in some cases at least, is shown by the way the violent and lawless actions of striking members, that disgrace their manhood and their state and belie every claimed principle and teaching of their organization, is winked at by their associates and the executive officers of the union. As in the strike at Buffalo, violence is generally publicly deprecated by the union officers, but no punishment is ever visited upon the members who disgrace it by their lawless actions, although by such they prove themselves to be the worst enemies of their union and the cause of labor.

The New York *Tribune* gives most valuable advice in regard to this which it will be well for those for whom it is meant to act on:

"The obvious and urgent duty of labor organizations is to take the lead in upholding and enforcing the laws which persons, pretending to act in the interest of those organizations, have violated. Whether the individuals are strikers or not makes no difference; they are lawbreakers. The body of organized workers can do nothing more effective to enlist public sympathy in their behalf, nothing to demonstrate more conclusively their own readiness to respect and obey the laws, than to expose and bring to justice those who have cast odium upon them and their organizations by illegal acts. If the switchmen at Buffalo and the steel-workers at Homestead want to kindle public opinion in their favor they have only to seize the men who have been burning, assaulting and shooting, and turn them over to the proper authorities for punishment."

The strike at Buffalo failed utterly, as it deserved to do, and as all such strikes born in violence and conducted in lawlessness will and deserve to fail. The engineers, firemen and conductors simply showed their good sense in keeping out of the disgraceful affair; as, had they become mixed up in it, the end would in all probability have been the same, and the disaster to labor all the greater.

A NEW STYLE OF TANK.

We describe and illustrate in this issue a new style of tank for locomotives used on the Wabash Railroad and which, it is intended, shall be adopted as standard on that road. The design of this tank is such that the coal pit is practically a hopper, so that the whole of the six tons of coal it is capable of holding will, as used, flow to the coal gate or within easy reach of the fireman. This not only lightens the labor of the fireman, but it insures that all the coal taken on the tender will be used up before it becomes slacked and rendered useless for fuel through exposure. The attainment of each of these objects accomplishes an economical purpose. As a general thing the physical labor of firing locomotives is such as to preclude the exercise of the needed intelligence to do the work most economically.

Contrivances to lighten this labor and encourage intelligent action—less muscular and more mental work—will generally result in increased economy of operating; and the using of all the fuel taken on the tender before its heat producing qualities are destroyed by exposure will add to the increased economy. Attempts are frequently made to accomplish this by instructing firemen to shovel the coal ahead every few days from the rear of the tank and the back of the pit. Such instructions are hard to enforce and are seldom obeyed. In our firing days we skinned our now editorial knuckles a good many times doing this particular job and we have never since had the heart to blame firemen for shirking it, or to insist upon their doing it. Mr Barnes has devised a better way and his example is worthy of following.

Economy in operating is also enhanced in several other ways by this style of tank. As the hopper is ample to hold the desired quantity of coal without having it piled up, as is usual with the ordinary style of tank, there will be less coal lost off while running—a very serious loss on some roads, and source of danger to trackmen; as the construction of the tank boxes provides a cleanly, dry and secure means for carrying supplies and tools, economy will result from avoiding injury and loss of same; and as with this construction the practice of carrying a couple of surplus tons of coal on the rear of the tender and in the back of the coal pit is precluded, the expense of uselessly hauling that amount around is avoided.

PASSIVE SUBMISSION TO TRAIN ROBBERS.

The two men who robbed the Los Angeles express on the Southern Pacific early in August made sure of detaining the train until their purpose was accomplished and their escape effected, by exploding a bomb on the left piston rod of the engine, thus breaking it and wrecking the guides and cross head on that side. One of the robbers is reported to have been formerly a locomotive engineer, and it was probably he who conceived the plan of disabling the engine in the way in which it was done, making sure of some delay to the train after they had departed, thus gaining time in which to insure their escape.

It has always been a source of wonder how one or two men, possessing guns and the courage to shoot them off, can capture a train containing a hundred or more men, some of them equally well armed, and rob and beat and kill at pleasure. In the case of this robbery it is said several deputy sheriffs were on the train, and, no doubt, all armed, but when the desperadoes exploded the first cartridge on the engine, they, with the other passengers, put their heads out of the windows to see what was going on, but drew them back again when they found pistol bullets and buckshot whistling past their ears. A panic ensued; the sheriffs and passengers scrambling under the seats to keep out of range of the flying missiles.

The robbers nearly blew the express car to pieces with dynamite, beat the express messenger over the head with their guns, and finally terrorized him into opening the safe, from which they took thirty or forty thousand dollars in gold and escaped.

Quite a different termination to an attempted robbery of a Union Pacific train occurred a few days later. While the train stopped at the coal chutes at La Salle, two masked men entered one of the cars, and with displayed revolvers ordered the passengers to hold up their hands. Hands in profusion went up instanter, and the fellows were on the point of collecting toll from the astonished passengers, when one of the latter opened fire upon the robbers. The latter returned the fire, but one of them getting hit they both jumped from the cars and fled.

Courageous resistance by trainmen and passengers would make the stories of our frequent train robberies read quite different, and would stop their frequency more effectually than all the legislative enactments ever thought of.

FLOODS AND FORESTS.

This has been a notable year in the history of inundations. In Europe and in North and South America, swollen streams have caused the greatest damage reported in recent years. In this country the Western States, as usual, have been the chief sufferers. The Western floods, in the early spring and summer months, reoccur each succeeding year with apparently greater accompanying disaster. Conservative estimates of the loss

this year through floods in the Missouri and Mississippi valleys alone reach $50,000,000; and yet there have been disastrous floods in other sections of the country to swell the amount. In all these floods railroad property is a prominent sufferer; trestles and bridges being washed away and road beds undermined, jeopardizing the lives of thousands of passengers, and actually adding, through resulting wrecks, a considerable proportion of the loss of life caused by the floods.

Systems of levees to confine the waters to the river beds, and systems of dykes to train the currents to scour the beds out deeper, give relief that is largely temporary in character, and more and more each year it is being realized by those most interested, that the final remedy must be in the protection of the winter's snow, lying on the mountains and high lands near the headwaters of rivers, from too rapidly melting by the sun in summer. The works of the engineer have been proved incapable of permanently remedying an evil caused by the destruction of the means provided by nature for regulating the flow of rivers. Forests are the natural preservers of snow from rapid melting, and their careless destruction near the sources of our rivers is largely responsible for the annually re-occurring summer floods, and disastrous changes in the distribution of rain.

In describing the modifying influence of forests on the action of rainfall, Mr. B. E. Fernow, Chief of the Division of Forestry, U. S. Department of Agriculture, says in his report, recently issued for 1891:

"It may be thought heterodox, but it is nevertheless true, that the manner in which most of the water of the atmosphere becomes available for human use (namely, in the form of rain) is by no means the most satisfactory, not only on account of the irregularity in time and quantity, but also on account of its detrimental mechanical action in falling; for in the fall it compacts the ground, impeding percolation. A large amount of what would be carried off by underground drainage is thus changed into surface-drainage waters. At the same time by this compacting of the soil, capillary action is increased and evaporation thereby accelerated. These surface waters also loosen rocks and soil, carrying these in their descent into the river courses and valleys, thus increasing dangers of high floods and destroying favorable cultural conditions, Here it is that water management, and, in connection with it, or as a part of it, forest management should be studied; for without forest management no rational water management is possible. The forest floor reduces or prevents the injurious mechanical action of the rain, and acts as a regulator of waterflow."

The people living near the river sources are also beginning to appreciate the importance of forest preservation. As stated recently by a resident of Idaho:

"It is not only the loss of the timber which these people deplore; they fully appreciate that the destruction of the forest means the ruin of their water supply. They may not be well informed in regard to the physical laws governing climate and rainfall and the influence of prevailing winds, but they know, what the people of the East are beginning to learn, that the forests regulate the flow of streams. They know that from the forest-covered hills come the perennial streams that keep their ditches full all the summer long, while from the barren mountains come the streams that tear away their dams and headgates in April, and become streaks of dry sand and hot bowlders in August."

The general interest that has been awakened in the matter has prompted national legislation in the shape of a bill presented to the last Congress, providing for an examination of all public lands covered with timber or undergrowth, and that they be set apart as forest reservations, except such as are more valuable for agriculture than for forest cover and culture. The bill provides for a Commission of Forests, with an adequate corps of inspectors, superintendents and police, to prevent trespass, fires, and illegal cutting of timber. The bill was favorably reported to the Senate by the committee to which it was referred, and will come up for an early consideration by the next session of Congress.

A general and definite understanding of the matter, and the adoption of some such law as that proposed, will result, in time, in changed conditions that will favorably affect the safety of life and property and travel, besides removing the cause of much annoying and expensive interruption of commerce.

ENCOURAGING WASTEFUL LOCOMOTIVE MANAGEMENT.

In a recent issue of the *Railroad Gazette* a throttle lever rigging is illustrated that is designed to allow of the regulation of the throttle opening by means of a screw, and "allows of a nicety of regulation in throttling that is not possible with the ordinary devices."

The device is used on the Mobile & Ohio Railroad, and was illustrated and described in the NATIONAL CAR AND LOCOMOTIVE BUILDER in January, 1891. The favorable mention it then received was that the stuffing box, having a follower, nut and gland, the same as is used on ordinary globe valves, was an improvement over the ordinary form of gland, secured and adjusted by means of studs screwed into the boiler head, and that the screw arrangement for operating the throttle lever permitted of nice regulation at starting and in switching.

Our contemporary in illustrating the device suggests a much broader field of usefulness for it, as follows:

"There are some features of this device that will commend themselves to those interested in having the best appliances for the control of the admission of steam into the cylinders by a throttle.

"There has been some question raised as to the relative merits of throttling steam with medium cut-offs, and the exclusive use of the reverse lever with full throttle for admittance of steam into the cylinders. It is the opinion of some that with the ordinary Stephenson link motion at very short cut-offs and high speeds, the control of the admission of steam by the reverse lever is not as good nor as efficient as is possible where longer cut-offs are used, and the steam is throttled.

"Indicator cards taken under both the above conditions have shown better results, and more efficient use of the steam is in some cases obtainable when the medium cut-off and throttled steam is used."

While this is very complimentary to the device illustrated it is the preaching of a doctrine of locomotive operating born in error and nourished by prejudice, which through the mismanagement it leads to costs American railroads many hundred thousand dollars annually in entirely unnecessary consumption of fuel. The preponderance of evidence that has appeared in recent years in the pages of the NATIONAL CAR AND LOCOMOTIVE BUILDER, the *Railroad Gazette* and the other railroad papers, has shown the fallacy of the arguments presented in support of throttled steam and late cut-offs. While necessary under some circumstances, as in starting, and when the power of the engine cannot be otherwise controlled, the practice with well designed engines is generally recognized, by those who have given the matter the most attention, as wasteful in the extreme. Master mechanics who are trying to get the most work out of every pound of fuel burned by their locomotives are more interested in seeing that the high tension steam, their modern expensive boilers are specially made to hold, is introduced to the cylinders with as little loss of energy on the way as possible, rather than in means for allowing "a nicety of regulation in throttling." The Schenectady Locomotive Works, prompted by a progressiveness of spirit that is most commendable, have adopted a new design of throttle, with an area of opening sixty per cent. greater than the capacity of the dry pipe, intending that this shall overcome wiredrawing of the steam through the openings of valves and give a maximum pressure in the steam chest. Means for nicely regulating the power to be developed by locomotives are very essential to proper and economical work, and the nice regulation afforded by the adjustment of a screw is none too nice, but the application should be made to the adjustment of the means of regulating the cut-off instead of the throttle. Land marks on the quadrant, and means for enabling a nice adjustment of the throttle while running, are simply so many encouragements given runners to adopt and follow wasteful methods of operating their engines.

Books Received.

The Comparative Merits of Various Systems of Car Lighting. By A. M. Wellington and Charles Whiting Baker, Editors *Engineering News*, and B. W. D. Penniman, Chemist, Baltimore & Ohio Railroad. With 77 illustrations and complete index. Price $1. New York: Engineering News Publishing Co., 1892.

This work, consisting of 303 pages, is a revised reprint of a series of articles that appeared in the pages of the *Engineering News* during the past year. The object of the book is to present the respective merits of the various systems of illuminating passenger cars, and to aid those interested in making an intelligent selection. The nature and comparative photometric efficiency of illuminants, the construction and cost of plants, and the cost of operating and maintaining same are the subheads under which the subject is treated.

Aside from the descriptions of the various systems of car lighting, the book is made up of records of new and searching tests of the different systems conducted by Mr. W. B. D. Penniman, chemist of the Baltimore & Ohio railroad, with the consent and co-operation of the proprietors of the respective systems. Altogether the book seems to be an intelligent and unbiased presentation of the whole subject of car lighting; which, because of its increasing importance to railroads and their patrons, appears at a most opportune time, and will prove interesting and instructive to its readers.

Railway Car Construction, by William Voss, 200 pages, about 500 engravings. Price $3. Published by R. M. Van Arsdale, 140 Nassau Street, New York.

This work was announced as ready in September. As most of our readers know it comprises the articles contributed to the NATIONAL CAR AND LOCOMOTIVE BUILDER on railway car construction during the past four years by Mr. Voss. The book is handsomely and substantially bound and contains much information to all interested in the construction or maintenance of cars. It contains full working drawings and descriptions of all types of cars used on American railroads, including the standard passenger and freight cars of several of the leading roads; also standards of the Master Car Builders' and Master Mechanics' Associations, and the Rules of Interchange of Cars. The reception of the book by the technical press has been uniformly courteous and free from adverse criticism. The author and publisher have been much gratified by the kind reception given the book, and by its already large sale in all parts of the world.

A Manual of the Steam Engine. Part II. Design, Construction and Operation. By Professor Robert H. Thurston, Director of Sibley College, Cornell University. Pages, 934. Illustrated. Good Index. Price $7.50. John Wiley & Sons, New York.

This is the second volume of this excellent treatise on the steam engine. The first volume, treating of the history, structure and theory of the steam engine, was recently noticed in these columns, and the volume now under consideration treats of design, construction and operation.

The book consists of eight chapters, treating respectively of the Design of the Steam Engine; Valves and Valve Motions; Regulation: Governors, Fly-Wheels, Inertia Effects; Construction and Erection; Operation, Care and Management; Engine and Boiler Trials; Specifications and Contracts; Finance, Costs and Estimates.

An appendix is added, giving the United States standard and metric measures; properties of copper-zinc alloys; properties of copper-tin alloys; weight of metals; form of boiler trial log; course of instruction. While the first part of the Manual constitutes an epitome of the purely scientific side of the subject, the second part presents in a concise manner the late and usually practiced methods in design, construction and management as adopted in the best current practice.

Street Railways; Their Construction, Operation and Maintenance. By C. B. Fairchild. Pages, 434. Illustrated. The Street Railway Publishing Company, New York.

This is a book devoted to the description and practical discussion of the various methods of constructing, operating and maintaining street railways. The subject is treated under the heads of Electric Traction; Cable Traction; Horse Traction; Steam, Air and Gas Motors; Inclined Planes, Rack Rail Inclines, Elevated Roads, Car Building, Track Construction, Discipline and Rules, Charter Franchises, Stocks and Bonds, Bookkeeping and the Classification of Street Railway Accounts. The leading types of cars are illustrated, and the pages throughout the book are interspread with illustrations of the various appliances in use in this service.

As indicated by the foregoing, the treatise covers the whole ground of street railway management, and, being the only book that does this, it cannot fail to be interesting and instructive to those connected with that industry, as well as to the general reader seeking information.

Poor's Manual of the Railroads of the United States for 1892. Containing detailed statements of the operations and condition of every railroad company in the country. In one volume. 1,500 pages, cloth, royal octavo. Price, $6 per copy. By Henry V. Poor. New York.

This invaluable publication comes to hand earlier than usual this year, but, as usual, is replete with interesting and valuable statistics. It contains 50 new maps of the large railroad systems. It contains statements showing in tabular form the mileage, equipment, capital stock, funded and floating debts, cost of road and equipment, investments, train mileage, passenger and freight statistics, earnings, expenses, interest and dividend payments, etc., etc., of the entire railroad system of the country and arranged by States and groups of States, besides detailed statements for every railroad in the country. Statements are also given showing for a series of years the total mileage, construction, stock, debt and cost of the railroads of the country, the total mileage of all the railroads of the world and numerous other selected statistics.

Flexible Metallic Tubing.

At a recent meeting of the British Association for the Advancement of Science, held at Edinburgh, on Aug. 2, Mr. S. R. Redgrave contributed a paper in which he described the Levavasseur flexible metallic tubing, which is made by winding strips of metal, so that the convolutions lock by their edges and overlapping.

In coiling this strip the smaller notch fits into the larger one, and room is allowed for a certain amount of play, so that a species of piston joint is obtained, as the small notch works within the larger one in a very similar way to that in which the piston travels in the cylinder. In tubes thus made, it becomes possible to omit the rubber and to obtain a perfectly tight joint between the metal surfaces. The amount of play or flexibility depends to some extent on the size of the pipe, the thickness of the metal strip employed, and the character of the section. The strips are rolled between a series of molettes, which produce the requisite corrugation, much on the same principle that the larger sections in iron and other metals are rolled in the mill. Recently, by an improvement in the processes of manufacture, it has become possible to produce a flexible pipe in which the coils are soldered together as the tube is formed, and the flexibility is obtained by the extension and compression of V-shaped folds in the metal.

Personal.

Mr. E. Hedley has been appointed Master Mechanic of the Brooklyn Elevated Railroads.

Mr. James Cunningham has been appointed Master Mechanic of the Buffalo Division of the Lehigh Valley.

Mr. Mason Young, of New York, has been appointed Receiver of the Jacksonville, Tampa & Key West road.

Mr. Jared Turrel, an old time conductor on the New York Central, has just retired from duty. His age is 82 years.

Mr. E. B. Wetmore, Superintendent and Master Mechanic of the Chicago & South Side Rapid Transit road, has resigned.

Mr. John G. Harris has been appointed Superintendent of the Pecos Valley railroad, to succeed Mr. W. H. Vaughan, resigned.

Mr. W. H. Rushforth, inventor of the Rushforth feed water heater, for utilizing the heat in locomotive smoke boxes, died at Rutherford, N. J., Aug. 20.

Mr. George R. Balch has been appointed Purchasing Agent of the Cincinnati, Hamilton & Dayton, vice Mr. C. G. Waldo, appointed assistant to the President.

Mr. Henry A. Barnes, formerly Superintendent of Motive Power of the Wisconsin Central, has been appointed General Foreman of the Illinois Central shops at Chicago.

Mr. C. F. Waldo, purchasing agent of the Cincinnati, Hamilton & Dayton, has been appointed assistant to President Woodford. He will be succeeded by Mr. George R. Balch.

Mr. J. O. Pattee, who has for the past four years been Master Mechanic of the Great Northern, has been appointed Superintendent of Motive Power of the entire Great Northern system.

Mr. Edward F. Mann, Superintendent of the Concord & Montreal Railroad, died at Concord, N. H., Aug. 19, at the age of 47. At an early age he entered the employ of the old Boston, Concord & Montreal road.

A circular has been issued announcing the appointment of Mr. S. D. Mason as Assistant Purchasing Agent of the Northern Pacific, with headquarters at Tacoma, Wash. The appointment took effect August 1.

Mr. S. D. Mason has been appointed Assistant Purchasing Agent of the Northern Pacific and Seattle, Lake Shore & Eastern roads. Mr. Mason has been for several years past Principal Assistant Engineer of the road.

Mr. Henry C. Gould has been elected Vice-President and General Manager of the Gould Coupler Company, and Mr. F. P. Huntley, for many years employed in a confidential capacity by Mr. Chas. A. Gould, has been elected Secretary of the company.

Mr. W. T. Baker has resigned his position as President of the World's Columbian Exposition on account of ill health. Mr. Baker is now in Europe, where he will remain for some months. Mr. H. N. Higinbotham, First Vice-President, has been elected President.

Mr. James L. Frazier, Superintendent of the Truckee division of the Southern Pacific, has been transferred to the Fresno division, with headquarters at Fresno ,Cal. He has been succeeded by Mr. J. H. Whiteed, formerly Superintendent of the Fresno division, whose headquarters will now be at Wadsworth, Nev.

Mr. Hugh Riddle, Chairman of the Executive Committee of the Chicago, Rock Island & Pacific and ex-President of that company, died at midnight, Aug. 10, of heart disease, from which he had been a sufferer for the past two years. His death occurred at his home in Chicago, the day being the seventieth anniversary of his birth. Mr. Riddle was born in Bedford, N. H., in 1822.

Mr. S. W. Huston, Master Mechanic of the Cornwall road, has been appointed Superintendent and Master Mechanic of the Chicago & South Side Rapid Transit road, to succeed Mr. E. B. Wetmore, resigned. Mr. Huston was Master Mechanic of the Cornwall road for several years, and was formerly connected with the Pennsylvania, serving in both the mechanical and operating departments.

Prof. Arthur T. Woods, formerly professor of Mechanical Engineering at the University of Illinois, and more recently of the Washington University, St. Louis, has accepted a position on the editorial staff of the *Railroad Gazette*. Professor Woods is very well known by railroad mechanical men through his contributions to the technical papers, and especially through his series of articles in the NATIONAL CAR AND LOCOMOTIVE BUILDER on compound locomotives. He is a pleasing writer and is very well qualified for his new duties. His headquarters will be in Chicago, where he will be associated with Mr. D. L. Barnes, Mechanical Engineer of the *Railroad Gazette*.

Colonel Henry Clay Nutt, formerly President of the Atlantic & Pacific Railroad Company, died in Boston Aug. 15, aged 50 years.

Mr. Nutt was born in Montpelier, Vt. He began life as a train newsboy, advancing steadily in the railroad business, until in 1851 he became Chief Engineer of Construction of the Peoria & Oquawka Railroad, now part of the Chicago, Burlington & Quincy system. From 1857 to 1876 he was Chief Engineer of the Council Bluffs & St. Joseph Railroad, and until the completion of the Union Pacific bridge across the Missouri he was a contractor for the transfer of freight over the river. He then engaged in the elevator business in Chicago until 1881, when he went to Boston to accept the presidency of the Atlantic & Pacific Railroad. He had been a sufferer for the past four years from paralysis.

Comment on "Railway Car Construction."

(From the *Railroad Gazette*.)

The sub-title of this book is "A work describing in detail and illustrating with scale drawings the different varieties of American cars as now built." This suggests accurately the scope of the book. One hundred and twenty-two quarto pages are occupied with the text and carefully dimensioned detail drawings of the various parts of American cars, both freight and passenger; 34 pages more, together with 5 large folding plates are given to special descriptions of individual cars, which are a Pullman, a Wagner, a Pennsylvania standard passenger, a New York Central standard passenger and a Boston & Albany standard passenger car. In an appendix are given the standards adopted by the Master Car Builders' and the Master Mechanics' Associations, including the Rules of Interchange.

Altogether the book occupies and well fills a unique position in the literature of railroading. It is a book which a great many people have long wanted, and which we are sure they will find, on the whole, very satisfactory. In this office we have very frequent occasion to look up dimensions of cars and parts of cars, and when the "Car Builders' Dictionary" is lacking in just the detail that we want, there comes a long search for drawings, which, perhaps, cannot be found. We expect, therefore, much comfort in Mr. Voss' book.

The volume is made up of papers which have been published in the NATIONAL CAR AND LOCOMOTIVE BUILDER within the last four years. Mr. Voss modestly disclaims any special fitness for the work, but he had the first great qualification of thorough familiarity with what he undertook to write about. He says that no new theories have been advanced, and that whoever looks for an ideal car in the pages of his book will be disappointed. We suggest that in this he shows his wisdom. The proper field of his book is exactly the one that he has confined himself to; that is, the thorough description, with accurate drawings, giving constructive details and dimensions of actual standard constructions. Although no alphabetical index is given, a good table of contents makes reference easy. On the whole the job has been well done, and we predict for the book an important and permanent place on the technical book lists.

A Fast Run on the C., B. & Q. R. R.

A remarkably fast run was recently made from Galesburg to Chicago on the C., B. & Q. R. R., with their fast train No. 6. The locomotive, No. 150, is one of their standard class H moguls, driving wheels 62-inch diameter over the tire, weighing, with tender, 83 tons. The train of 10 cars, including three Pullman sleeping cars and a dining car, weighing 357 tons, exclusive of passengers and baggage in the baggage cars.

The distance from Galesburg to Chicago, 162½ miles, was made in 3 hours and 45 minutes, including 7 stops and 4 slowups. The actual running time, excluding stops and slowups, was 3 hours even, making an average speed of 54 miles per hour. The distance from Mendota to Aurora, 45½ miles, was made in 53½ minutes, including a stop for a railroad crossing. The fastest speed made was at the rate of 73 miles per hour down a grade 36 feet to the mile.

The above particulars are taken from dynamometer car records and are absolutely reliable. Considering the weight of the train and the distance run, this performance ranks among the fastest runs of the world, and is a splendid attestation of the excellence of the C., B. & Q. class H engines, which, as it is well known, are simple 19 by 24 inch mogul locomotives with Belpaire boilers.

Two unfortunate men were beheaded by passing trains in August. Jas. A. Stewart, a fireman on the Philadelphia, Wilmington & Baltimore road was beheaded by a passing train while leaning out of his cab window on the night of Aug. 5. A few days later Joseph Dorsden, a New York Central trackman, was struck by a train and his head was cut off.

What Is "Accuracy?"

There are many descriptive terms used in catalogues of machinery builders and elsewhere, which, while they sound very well, and as though they ought to have some definite meaning, really have absolutely no meaning whatever, and it seems to us there could be some little improvement in this respect which would result in good for all. For instance, just what idea is conveyed by the term "accurate," or "first class workmanship" when used by a manufacturer in describing his machine? Different manufacturers have widely variant conceptions of accuracy, and a job that one would call very accurate would certainly fall far short of passing the inspectors of another manufacturer. And a further fact is that it often happens that the machine turned out by the manufacturer having the highest standard regarding accuracy and good workmanship goes into the hands of a user who knows next to nothing about such work, and vice versa. We all know that we can buy lathes or planers, for instance, of about the same weight and general appearance, at prices varying by as much as 50 per cent. at least, and the maker of each will describe them as being constructed with the highest degree of accuracy, and that the workmanship is first class throughout. Each may be entirely honest, but the ideas of the two men as to what constitutes an accurate machine are totally different, while the ideas of a prospective purchaser may be lower or higher than either of them.

A drill press may be sold for an accurate machine, and in nine cases out of ten go into the hands of men who will never know whether it is really accurate or not; it does their work good enough, and that is sufficient. But the tenth man may need a really accurate drill press, and may, therefore, put a sweep into the spindle, and determine just how much the table is out of square with the spindle. Then when he writes to the manufacturer complaining that his "so-called accurate drill press" is out .003 ins., he gets a reply full of virtuous indignation, and wanting to know "what you expect for a hundred dollars?" and, furthermore, presenting the knock-down argument, that "we have sold these drill presses for years to the best known concerns in the country, and yours is the first complaint we have ever received in respect to their accuracy."

Now the real truth is that the nine men do not need a drill press of the highest attainable accuracy, and would refuse to pay a fair price for such a machine, while the tenth man should expect to pay more than the others, simply because he wants a thing of greater intrinsic value. It seems to us that it would be better for all concerned if tool builders, especially, would always specify what they mean by the terms "accurate" and "first class work," or, what would perhaps be better, do away with such terms, and specify in decimal parts of an inch just how much variation from absolute accuracy is permitted in the construction of the machines. By this plan those who were looking for any certain grade of workmanship in a tool could definitely know what they were buying, and those who were really doing the best work would get credit for it, and, we hope, money proportionately. We would go further than this, and imitate to some extent the watch manufacturers. We all know that tools require some adjustment upon the floor. In lathes, for instance, the spindles must be brought into accurate alignment, if at all, by skilled workmen provided with means of testing and correcting defects, until practical perfection is reached. This process, if thoroughly done, is usually expensive, and for many purposes for which lathes are used, is entirely unnecessary and superfluous. There is no reason why the man who does not need this refinement should be compelled to pay for it in order to get the lathe which, in other respects, suits him, while the man who really needs the highest accuracy should be able to get it in almost any make of lathe he may choose, by simply paying a somewhat higher price for the extra cost of the adjustment. If we are buying iron or steel, the amount we pay for is definitely stated in pounds; there is a good reason, when we are paying for accuracy in machine construction, that the degree of accuracy should be specified in equally definite terms. Of course, for the protection of the manufacturers, machines so made should be graded and marked by grades, so that a lower grade machine may not at any future time be taken to represent the maker's best practice.

Watch manufacturers often make and sell watches precisely alike, except that some are adjusted to temperature and position, while others are not, and they charge corresponding prices. Why should not tool builders do the same, or an analogous thing?—*The American Machinist.*

The Philadelphia & Reading has recently put on a fast train to accommodate the travel between New York and Atlantic City. It is scheduled to make the run between the two cities in 75 minutes. Ten minutes are allowed for the ferry trip from New York to Kaighn's Point, leaving 60 minutes for the 55.5 miles from that station to Atlantic City. For the first two miles, however, no high speed can be made on account of the grade crossing of the West Jersey Railroad, so that as a matter of fact the remaining 53.5 miles have to be made in 54 or 55 minutes.

Passenger Car Painting.

BY ROBERT M'KEON.*

OUTSIDE FINISH.

The trucks, steps and platforms of the car we prime with any good mineral paint, coating all parts both inside and out, as well as all iron work. And there being so large an amount of iron work on the trucks, we never use lead on them, as it will not wear as well on iron as a mineral paint. We putty up and glaze over all roughness on the wood and iron where exposed, then sand-paper and apply a coat of the standard truck color of the road. It is not necessary to coat the inside with this, as the priming and the third or last coat will be sufficient. Sand-paper lightly and give a coat of varnish color over the entire trucks, both outside and inside, also coat the steps and platforms with the same number of coats. The varnish color is made with equal parts in weight of the japan color used and varnish.

There are different shades of color in use for the finish of trucks on a passenger car; it is generally darker than the body color and that which sets off a body color of Tuscan red, and harmonizes well with it, is olive green or a Pullman color. This is striped with a half inch line of black or Indian red, if striped at all, but striping on trucks or steps is unnecessary on an ordinary passenger coach; whatever the style of striping is on the trucks, the steps and end rail of the platform should be finished to correspond, being the same style of finish. One heavy coat of varnish on the trucks and steps is all that is required.

The truck wheels being new, or old ones well cleaned with naphtha and cotton waste, I give them two coats of Venetian red ground in japan and one coat of varnish. Wheels painted red will look well for a trip or two on the road, or while standing in the yard before the car goes into service, but very soon become dirty, and unless they are regularly cleaned at terminals, which is seldom done, they had better be given a coat of cheap black and let go at that.

The platform railing being new iron, or scraped clean and free from all old scaly paint, we give them a coat of Prince's mineral paint so as to dry flat but with sufficient oil in it to dry firm. If they are rough, a second coat of the mineral should be given quite heavy, but to dry flat; then sandpaper thoroughly and apply a coat of drop black in japan and finish with a coat of varnish. All truss rods, air and gas cylinders, check chains, etc., under the body, have one coat of heavy lamp black varnish color; the crown molding of the body and upper deck is coated with drop black and varnished, although this is not done until after the roof is painted.

We now come to the painting of the passenger car roof, and we consider this of as great importance as any other part of the car. And how to paint a tin roof, and have it to do good service is something that is more difficult of solution than many would suppose on first thought. I have heard this subject reviewed at several painters' conventions, but nothing definite was arrived at in any of the discussions I have listened to. We all know that tin has a bright surface and that ordinary paint, as applied on wood, will not adhere to it; there is nothing for it to cling to; it is like coating over a piece of glass; and the question may arise, how should the bright surface be treated before receiving the paint? We have heard it advocated that it was a good plan to let the tin rust before painting, but I do not know how this would operate, whether beneficially or otherwise, as I have never given it a test and would not take any stock in the theory that the rust has a tendency to increase adhesion of the paint over it any more than rusted iron would hold the paint. The bright tin does protect the iron under it, and that is what it is put there for, and why should it be allowed to rust before being painted? Still we have heard of this plan being adopted by both car and house painters, and they claimed that paint would adhere better to the rusted surface of the tin.

I do not, from my own experience, believe that any previous preparation is needed before the paint is applied, with the exception that after the tinners have completed the roof we take a putty knife and scrape the rosin off the seams; then with naphtha and waste or a sponge, wash off the entire roof. This is done for the purpose of removing the greasy substance that will be found on it after the roofers have left it, as well as to remove the acid which is frequently used for soldering in place of the rosin. When all is wiped off clean we take Prince's metallic paint in paste form, or Venetian red that has been ground stiff in boiled linseed oil, and thin down with equal parts of boiled oil, japan and turpentine, apply the priming coat quite light with just sufficient pigment in it to cover, well—say one pound of the paste paint to three pounds of vehicle—then give it time to dry. There is always plenty of time for painting a passenger car roof while the car is in the shop, and it is very important that this coat should dry hard; give it from three to five days, then examine it and you will find a good foundation and reasonably hard on which to apply the following coats of paint. The second coat we mix the same as the priming, putting it on about the same thickness. When well dried prepare the third coat with the same proportion of the paste paint, but using only oil and japan—that is, to one pound of pigment use two pounds of boiled oil and one pound of japan. No turpentine in this coat. Put the several coats on lightly, brush it on well and spread it evenly; it is not the heavy body of paint that wears the best, but it is the vehicles that give it the durability and no more pigment is necessary than just a sufficient quantity to make a covering body on each coat, and the proportions given I have found to give the most satisfactory results.

Why does the paint on passenger car roofs crack and flake off in blisters when repainted several times? It is undoubtedly owing to the thick body of paint on them, and the vibration of the tin opens up the cracks in the paint, which sucks in the dampness and wet, and by lying in those cracks will soon work through and rust the tin, and finally scale off the paint, so it is very evident that the reason paint on tin roofs does not wear better is due to the heavy coatings of paint applied to them. The oil will protect them and we should use the pigment sparingly, giving a new roof but three coats; and when the car comes in the shop once a year for revarnishing, give the roof one coat only, a light one as before. It may be necessary to give an extra coat to the projecting ends of the roof, as these are worn off by the constant beating of the hot cinders against them from the engine; but let what paint is put on be well spread with the brush and not allowed to lie heavily or in runs in the seams, for these are most liable to give way and break if a heavy coating is left on them.

INSIDE FINISH.

For the inside finish of the car it is necessary to prepare a filling that will dry hard and somewhat elastic; it should be tough, but not oily, nor should it dry tacky, but mixed so that it will make a hard and compact surface. It should be prepared with but a small portion of turpentine. There are several fillers in the market claiming to give good satisfaction, so far as filling the wood thoroughly, and they may be durable, although we never gave any of them a trial, as I always preferred to make my own. Take corn starch in sufficient quantity to make the filling for the entire inside of the car, put it in a pail and add to it equal portions in weight of raw linseed oil, japan gold size, and inside car finishing varnish. Mix it well into a thin paste, run it through the paint mill loosely, so as to mix the corn starch and vehicles, then thin down the quantity required for daily use with turpentine to a free working consistency. The wood work being well dusted off, apply a full coat with a rather elastic brush, so that a heavy coat can be given or one that will cover the surface solid. This will set on all flat work and panels in 15 minutes so that it will be ready to scrape, which we do with a broad knife on all large surfaces, scraping downward so as to press the filler into the open grain and pores of the wood. When this is done take a piece of moss and rub the work lightly, which removes any loose material, and this must be done before the filling has dried hard; in fact the panel must be completed within an hour, or the filling will get too dry and be difficult to remove from the work. If the wood is coarse grained or porous, such as ash, oak and bird's eye maple, we give a second coat of filling the following day, and it pays us well, as this extra coat saves a coat of varnish. It is said that vegetable filling will soon decay in the wood, especially that which is made with corn starch, but we prevent that by the use of a large portion of raw oil and varnish, which, with the japan gold size, forms a solid ground on the filling and one that the varnish will not sink into, as it will on a filling made with a less quantity of elastic liquids and pure turpentine. Let the filling coats dry forty-eight hours, then sandpaper down lightly to clean up the surface with No. 1-2 sandpaper, and see that no spots of the filling are left on the surface, as this will mar its beauty when the final finish is put on. Dust clean and apply a very light coat of amber gum shellac for all dark woods, but for very light wood, such as maple and white ash, use white shellac if you desire to keep the work clear. One coat of shellac is sufficient for any finish, and, in fact, I have done the best of work without any shellac whatever, and have applied my varnish directly over the filling on more jobs of work than I have applied the shellac. I believe there is less liability to crack, as we have by this plan no brittle substance under our varnish to break loose, although the one light coat will not do any serious damage and does hasten the finish of the job.

There are several varieties of woods used for the interior finish of passenger coaches, such as mahogany, cherry, maple, ash and oak, but the present style of finish is mostly in quartered oak, which is a new departure, and presents a very fine finish. All filled and varnished woods are liable to become darker by age; the darkening is caused not alone by the material applied to them, but by exposure to light.

Whatever puttying is necessary should be done after the shellac coat is given, or if no shellac is used, then after the first coat of varnish, when the putty can be easily matched to the color of the wood. In making putty for all natural or hardwood finish use no lead, as it is liable to change its color, but make your putty with whiting and color it to the shade required with umbers, siennas and ochre, which if used in the proper proportions, will match any of the woods used in inside car finish. Get as little putty on the surface as possible; simply fill the hole or defect, leaving the putty a little flush, and it will sandpaper down level. In mixing the putty use but a small portion of raw oil, or say about equal parts of oil, japan gold size and inside finishing varnish. This will dry hard, and with the varnish in the putty it will not absorb the varnish applied over it, which changes the color of putty if it is made without the varnish. We have often noticed inside finish in cars that had been out but a few months, especially on light woods, that showed the putty very plainly, which was undoubtedly matched to the wood when the puttying was done, but on investigation I have always found that the putty was made with lead, and was brittle or short-grained and had not elasticity sufficient to prevent absorption of the varnish. Of course, as stated before, the wood will gradually grow darker with age, and therefore it is better to have the putty a shade darker when the wood is matched.

The varnish best suited for inside finish is one that dries in forty-eight hours. Give three coats of this where a first-class finish is desired, sand-papering on the first coat pretty thoroughly with No. 1-2 paper, and hairing off on the second coat to deaden the gloss before giving the third coat; this gives us a good body of varnish to rub down on. The work having stood three days, after applying the last coat of varnish, we proceed to rub down evenly with No. 0 ground pumice stone and water, using felt rubbing cloth and a stub of a bristle brush for corners of panels, mouldings and fluted work, also carving. Although very little carving is now being done on the prevailing style of finish, that, with the decoration on the inside body of the car, is gone out of date, as a plain substantial finish is considered neater and less expensive, as well as being more easily kept clean.

After rubbing, and when the car is fitted up ready for the road, go over the entire surface with raw linseed oil, wiping off perfectly dry with white cotton waste, giving the final wiping with a new chamois skin. This oiling makes a good many edges that may be rubbed through and gives an even lustre, and the chamois skin takes up any oil left on the surface after it has been wiped with the waste.

In the formula and method of finish given above, I wish to impress on all the importance of filling the wood properly at the start, saving as it does both in labor and material on the subsequent coats of varnish, and if filling is properly mixed it is very beneficial to the wood. The most important consideration is to fill the open grain of the wood perfectly, so that when the job is completed it will present a smooth surface, and it can be finished with an eggshell gloss, or if preferred, a little extra labor with oil and rotten stone will give it a good polish.

The sash and inside of the blind frames we fill the same as the other inside work, and the same number of coats of varnish, and rub down the sash, but not the blinds; these we hair off to deaden the gloss. The blind slots and outside frame of the blind we prepare by giving a coat of three parts raw oil and one part turps, which is a better protection to them than shellac would be, as they are exposed so much on the outside to the weather. This will dry in three days, when we give three coats of the outside body finishing varnish, and you will have a blind that will do good service, and hold its color better than where it is finished on the outside with the same method as the inside of the sash is, which is usually the case. And in a short time the lower half of the blind becomes stained and weather-beaten on the outside from exposure. The chairs in the car are wood, and those are finished the same as the other woodwork, but are not rubbed. We leave all work below the window stools in gloss; it is much better, and saves considerable labor, although a light rubbing with curled hair, just sufficient to deaden the lustre, may be given it.

If the floor of our car is a new one, I should not put any paint whatever on it. I think painted floors are a great expense, with no corresponding amount of benefit, and I should give a new floor, while clean, a coat of raw oil put on quite warm, so it will penetrate well into the wood. Put this on late in the day, and next morning it is all dried in, and when time will allow of it and not interfere with the work, give it a second coat, quite hot, as before, which fills the pores and grain of the wood. When putting on the second coat, have a man follow up with a bunch of moss, and rub it in well, then wipe dry, and we have a floor that will outwear any of the painted ones, and will look well for a long time; it will clean off easily, and we have no paint on it to scuff off with the feet. Just before the car goes into service, and when the fitting up is completed, give the floor a good cleaning with a weak soap, and follow up with a coat of oil, which should be wiped off perfectly dry. For old passenger car floors that are badly worn, we must give two or three coats of paint, so that they may go out looking clean and neat; and for a floor color a warm buff is preferable, and more in harmony with the surroundings than any other color that could be given.

* In *The Painters' Magazine.*

The best handles of small tools, says an expert on the subject, are made from the wood of the apple tree, which is extremely hard when dry, and possesses a fine grain. Moreover, it does not check easily after it has been dressed.

The Cincinnati, Portsmouth & Virginia Railroad shops, at Portsmouth, O., were destroyed by fire Aug. 23. The loss is estimated at from $30,000 to $40,000.

Railroads in the Hawaiian Isles.

Editor National Car and Locomotive Builder:

Two thousand miles from the shores of the United States, and right in the track of ocean steamers, plying between America and Asia, is Oahu, one of the above named group. But four years ago the man was looked upon as a visionary who advocated a railroad here, but American energy broke down all barriers, and at the present time there is a road well equipped and operated successfully after the American system. Thousands of acres of the finest land that formerly was nothing but a barren waste has been reclaimed, and is now under cultivation.

Simultaneously with the growth of the railroad has sprung into being two sugar plantations with an annual yield of 4,000 tons, and in the course of a few years will increase to 8,000 tons. It is the intention of the promoters of this road to continue it around the island a distance of 60 miles. There are about eight plantations through which the line will pass, and a vast extent of land will be opened up for settlers.

OAHU RAILROAD DEPOT, HONOLULU.

The Oahu Railroad Company operates at the present time 23 miles of narrow gage road. The original rail was of a fine grade of steel, 35-pounds to the yard, but as traffic has increased considerably, on all new extension there is now being laid a 40-pound rail. On the opening of the road (Sept. 4, 1889) the rolling stock consisted of one 7-ton Baldwin locomotive and six canopy-top cars. This has been continually added to as occasion called for, and at the present time there are five locomotives — the largest without tender weighs 22 tons—which has just been turned out of the shop here after undergoing general repairs. All the locomotives are supplied with the Westinghouse automatic air brake and modern improvements. In the car department there is one parlor car which will compare favorably with any of its kind on American roads; there are also eight first-class coaches and six excursion cars, built by Carter Brothers, Newark, Cal.; they are after the American style and in finish throughout are handsome in every detail, and they are supplied with the Miller hook, buffer and platform.

There are ten box cars, eight flat cars and three stock cars, some of which have been built at the company's shop here. The rolling stock is fitted throughout with air brakes, and the company are having a test with the swing bolster and rigid bolster trucks, to determine which is the most beneficial and economical. A wrecking car of 25 tons' capacity makes up the list.

The present site of the principal offices, shops, yards, etc., was formerly a swamp. The theory of Copernicus did not create as much wonder as did the action of the manager, Mr. F. B. Dillingham, when he purchased in San Francisco a steam shovel, with a capacity of 1,000 cu. yds. per day, and in a short space of time filled in 44 acres and immediately erected a round house of five stalls, and machine shop, car shed and shops, turn tables and coal bunkers, a warehouse capable of storing 4,000 tons of sugar or merchandise, and also a depot two stories in height. In the upper story is situated the general offices, the ground floor being taken up with ticket and freight offices and waiting rooms.

One of the great advantages possessed by this road is its water front facilities. Heretofore it took from two days to one week to get the products of the country into market—or to the ship. Now the native cuts his fruit in the morning; that night it is crossing the mild Pacific for California. Starting from Honolulu, the line passes through endless fields of rice interspersed with pineapple, orange and banana farms. There are several stations along the line; at all are neat and commodious waiting rooms.

Twelve miles from Honolulu the company have laid out a town site. It is beautifully situated and promises in the near future to become a city of no mean importance. A fine depot, round house and turntable are erected at this place and it is the intention of the company to build shops there capable of doing all its work. The present terminus of the road is the Ewa sugar plantation, seven miles from Pearl City. The latest improvement is a coaling plant capable of handling 1,000 tons per day. The traffic in coal is considerable, there being several lines of steamers plying between the islands. This port is also a rendezvous for war ships of all nations, and also a call-port for large steamships plying between California, Australia, Japan, China, etc., all of which take in a supply of coal.

Our General Manager, Mr. Dillingham, is a native of Massachusetts and is much respected here for his business qualifications and character. The Superintendent, Mr. Ashley, is a Californian, and has the faculty of so handling men that they vie with each other as to who shall take the most interest in the work, and it is mostly to his indefatigable labors that the present status of the road is due.

JOHN HUGHES.
M. C. B. Oahu Railroad.

Honolulu, July 19, 1892.

Railroading in Honduras.

Editor National Car and Locomotive Builder:

It is announced that the International Railroad of the Republic of Honduras has been sold.

What reminiscences that little item conjures up! I have ascended Vesuvius, have slid down the Alps, and have crossed the Pampas; but they are infinitesimal achievements compared to the fact that I have made a trip on the Honduras Railroad, aforesaid, and came away alive.

This alleged railroad is about thirty-five miles long, and leads from the coast through some swamps and banana plantations to the town of San Pedro Sula.

It was quite early in the morning when I landed. A native directed me to the so-called superintendent's office, of the railroad. It was a mud hut, with no windows, and with no flooring except the bare earth. I looked in but saw nobody. Just as I was leaving, something stirred in a hammock swinging between the rafters, and I saw an emaciated man, of perhaps fifty, looking down upon me. "Hello," I said, "are you the superintendent of the railroad?"

"I am," was the answer; "are you the only passenger?"

"Yes, sir; I believe I am; how soon will the train go?"

The superintendent looked at me, speechless for a while, then turned around in his hammock, leaned over and informed me that of course there would be no train that day. That, perhaps, a train might be dispatched to-morrow, or, perhaps, the day after to-morrow. "A great deal depends upon 'Nigger Jim,' our engineer," he said. "If Jim don't start, there is no train." He then told me that Jim was the only person thereabouts who knew how to run an engine, and that he was not at all reliable; in fact, full of moods, and he had to be handled very delicately. "Take it easy," said the official; "don't try to rush things in this country. Make yourself at home here; I'll do what I can for you." I followed his advice, and perforce took it easy for two days waiting for the first train. At daybreak the next morning I anxiously inquired of my host what he thought about the probability of a train that day. He climbed out of his hammock and peered across the bay.

"Jim hasn't fired up yet," he said, and there will be no train to-day. But," he added, and slapped me on the shoulder with a wistful look, as if sorry over the prospect of my finally becoming a passenger on his train, "to-morrow I shall probably have a train, because it's the end of the week, and there is a load of bananas to fetch for Monday's steamer."

So I fretted through another day, and at last, at daybreak the next morning, I discovered a thin column of smoke rising over the heads of the palm trees. No depot, no station-house was visible near and far, only two streaks of rusty rails ran through the high grass, and lost themselves in the crescent toward the bay. Another hour passed, and then the air was filled with a hissing, puffing,

rumbling sound, and very soon one of the most wretched locomotives, pulling a box-car, came in sight, and stopped near us. About a dozen functionaries clambered from the engine, followed by the redoubtable "Nigger Jim" himself.

I was asked to get aboard, and the superintendent bid me farewell, after firmly refusing to accept any compensation for boarding me for two days. I paid him the regular fare for the trip, however, and that was $4. The formality of a ticket was dispensed with. The car had a wooden bench along the sides, for the passengers to make themselves uncomfortable upon. All of Jim's assistants jumped upon the engine, and we started. I noticed that we were running with only one cylinder. I clambered upon the engine myself, and engaged Jim in conversation. He told me that some years ago the piston rod of one cylinder broke, and as there was no machine shop within a thousand miles, it had never been repaired.

While climbing a heavy grade, two of the assistants on the engine sat on each side of the pilot, directly over the rails, with a small box filled with sand on their laps. Every few minutes they would take a fistful of sand, lean over and carefully strew the sand on the rails, so as to prevent slipping. The engine crept slowly along, and was finally stopped on a trestle-work, directly over a little stream. Then Nigger Jim uncovered the manhole of the tank of his ramshackle engine, nearly all his assistants got into the water, and in regular fire-brigade style, handed filled buckets from man to man, until they reached Jim, who dumped the water into the tank. Two of the men built a fire alongside of the engine, and began cooking the morning meal for all hands. After a couple of hours' delay, another start was made, and soon we ran into a dense wood. Again all hands got off, and disappeared into the thicket for the purpose of looking for firewood. Within two or three hours a lot of wood was stowed on the tender, and away we went again. Within an hour we stopped for dinner; it being now 3 p. m., having made 18 miles in seven hours from the time of starting. Soon after the next start was made, we ran into a swamp, where the track was submerged in water. The engineer got up all the steam he dared, and then rushed through the water at the terrific rate of four miles an hour. As soon as we came up to the dry piece of track again, our fire was found to be extinguished, and had to be rekindled.

After another short run there was a sudden stop, and Nigger Jim jumped from the engine with a crow-bar in his hand. He proceeded down the track whence we had just come, and tore up a rail. This he and his assistants carried forward past the train, and laid it down some few feet ahead of the engine.

One rail was missing from the track. Each time the train ran over the road, it had to stop at this place, and a rail be taken up behind and put down in front.

After the stars had come out that night—fully fifteen hours after starting—we pulled into San Pedro Sula, the end of my journey and of the International Railroad of Honduras.

A TRAVELER.

Effect of Scale and Soot on Tubes.

The importance of keeping boilers clean as a matter of economy is quite generally recognized; but occasionally those are heard from who doubt that scale and soot on boiler tubes retards the transmission of heat to any great extent. Therefore the results of two tests of the same boiler under the different conditions of being foul and clean as reported by *The Locomotive*, may be of interest. The conditions of the tests were that the first test was made when the boiler had been in constant use four weeks since being cleaned of scale and soot; and the second test was made when the boiler had been in use but a day and a night since being cleaned of scale and soot.

	First test.	Second test.
Average steam pressure	82 lbs.	79 lbs.
Average temperature of feed water	136°	143°
Water evaporated	33,914 lbs.	38,965 lbs.
Coal consumed	4,530 lbs.	4,617 lbs.
Ashes removed	377 lbs.	305 lbs.
Water evaporated per pound of coal	7.48 lbs.	8.44 lbs.
Water evaporated from and at 212° per pound of coal	8.34 lbs.	9.34 lbs.
Water evaporated per pound of combustible	8.17 lbs.	9.04 lbs.
Weter evaporated from and at 212° per pound of combustible	9.09 lbs.	10.0 lbs.
Temperature of escaping gases	551°	556.7°
Horse power developed	157	179

From this it will be seen that there was a better performance with the clean boiler, and the evaporation of .91 of a pound of water more with each pound of combustible than with a foul boiler. The coal used was bituminous coal from the same mine.

Some discussion took place last year on the value of Eucalyptus fluid as a disincrustator for locomotive boilers. It is interesting to note that extensive trials have been made with the fluid on the Eastern Bengal State Railway, the preparation being manufactured on the spot from leaves obtained from the Saharanpur botanical gardens. On the whole, the result has been very satisfactory. Eucalyptus, it is reported, has the effect of gradually softening the scale which forms on the barrel, tubes and firebox, and the deposit can be scraped and washed off without difficulty. Attempts have been made to grow the plant on the lands of the Northwestern Railway, but hitherto without success.—*Indian Engineer.*

Coal in Peru.

The scarity of coal in nearly all of the South American republics is a great drawback to all manufacturing and railroad enterprises. Peru, however, seems to be bountifully supplied with this very necessary fuel. Mr. Edmund Lane, late engineer of the Callao & Oroya railroad, in writing of the mineral and fuel resources of Peru, says:

"The country is divided by the Cordilleras into distinct longitudinal regions, viz., the coast, the Sierra and the Montaña. The Sierra is the region of numerous mines and of the precious metals. The Montaña is an immense and heavily timbered region lying on the eastern slopes of the Andes and extends to the Amazon. In the beds of the torrent streams are found rich deposits of gold. On the coast exist large deposits of common salt, nitrate of soda and petroleum, with shipping ports conveniently adjacent. In the spurs or branches of the Cordilleras of the Andes are found coal (both bituminous and anthracite), gold, silver, copper, lead and cinnabar, besides a number of other minerals. As a general axiom, the more valuable a mineral deposit is the more difficult is the access to it. This eminently applies to the mineral regions of Peru. The lack of railways, and even of good mule roads is the main reason why so much of the mineral wealth of Peru remains to this day in a more or less virgin state.

The coal deposits, vast as they are, have been practically untouched. Good bituminous coal is found in the department of Junin, within a short distance of Oroya on the Amazonian slope, to which town the Central Railway will shortly be opened. Coke made from this coal has already been successfully used on a large scale at the Casapalca smelting works. At Cerro de Pasco, and close to the proposed line of railway, immense bituminous coal deposits exist. This coal will be available for smelting and general purposes when once brought within reach by the railroad, and industries heretofore financially impracticable will spring up. Some idea of the economy that will result may be formed when it is known that once the railroad is completed to Cerro de Pasco, this can be mined and placed on the cars at from $1.80 to $2.40 a ton. Bituminous coal is found in many other parts of Peru, but the deposits especially referred to are those which the projected lines of railway will make immediately available. This coal is burnt in grates in the houses of Cerro de Pasco.

Anthracite coal is found in the Department of Ancacha in inexhaustible quantities, and immediately contiguous to the proposed line of railway from Chimbote to Caraz. Landing at the port of Chimbote, and following the Santa River up its at present almost impassable gorge, large measures of anthracite coal are found at various points. Within a quarter of a mile of the town of Caraz, which has a population of 8,000 people, coal deposits exist from which the coal can be readily mined and placed on the trucks for $1.50 to $1.80 a ton. Anthracite coal is also abundant in the province of Huamachuco. Numerous beds exist in the sandstone formation. Near Huamachuco there are two mines worked, the measures in which are 1½ and 2 meters thick respectively. In Llary the coal measure is 4 meters thick, and at the Victoria Smelting Works this coal is used for smelting the ores. The analyses of the various coal samples go to show that they do not compare unfavorably with American and English coal Large deposits of lignite are found in the Departments of Arequipa and Puno.

[. . . A bad wreck occurred on the Lake Shore & Michigan Southern road nine miles east of Erie, Pa., on the night of Aug. 5, when "the flyer," east bound, collided with a freight wreck that had been thrown across the main track only a few seconds ahead of it. Besides the passenger engine, one sleeping car was damaged and a buffet car totally wrecked. The engineer and fireman of the passenger engine were instantly killed and several passengers were hurt, one seriously. The obstruction on the line was caused by a fast freight train, colliding with the rear of a slower freight train, which was entering a side track to allow the fast freight to pass. The collision wrecked seven freight cars, two of which were thrown across the main line. This happened just when the flyer was due, and within a few seconds it struck the obstruction at high speed.

The following night another wreck occurred on the same road. The New York and Chicago limited express was wrecked at Ligonier, Indiana, by colliding with a light engine on a curve east of the station. The engineer of the passenger train had his left leg broken and his foot crushed and sustained other injuries which may prove fatal. The passenger engine was thrown upon its side, but none of the oaches left the track.

The boiler of a switch engine in the Georgia Central Railroad yards at Atlanta, Ga., exploded Aug. 18, while hauling a train of empty cars. Six men were on the engine, but none of them were seriously injured. The accident is said to have been due to the effect of alum in the feed water.

A locomotive boiler explosion occurred on the Iron Mountain Railroad at Memphis, Tenn., Aug. 21, when the engine was pushing a heavy freight train. The engineer and fireman were killed.

Another Chicago Elevated Railroad.

Chicago papers state that the building of a West Side elevated road is assured. Work is to commence at a number of places on the line as soon as the surveyors have completed their work, and the construction will be pushed with all the energy that ample capital can throw into an enterprise. The projectors expect that a year from now the road will be in operation. The road will be constructed by the West Side Construction Company. The company is said to now have in hand ample capital for all requirements, the floating of its first block of $10,000,000 5 per cent. bonds having been completed.

The road is to be built from Fifth Avenue west between Van Buren and Jackson Streets to Sangamon Street. At this point the line drops down a block to the alley midway between Van Buren and Congress Streets. It is carried directly west to a north and south alley between Wood street and Ashland Avenue. A line runs north and south on this alley between Nineteenth Street and Milwaukee Avenue. This line will be carried out northwest parallel with Milwaukee Avenue and west on Nineteenth Street to the Grant Locomotive Works. Two other branches are to be extended west from the north and south line at intermediate points.

Queen Victoria's two private cars or "saloons," are described as being connected by a vestibuled passage, fitted with electric bells and lighted with oil lamps, as the Queen does not like the electric light for reading and writing.

The day saloon is furnished with sofas, arm chairs and various kinds of foot stools, all covered in blue silk, with fringes and tassels of yellow; the walls are hung with blue and pearl gray silk, brocaded with the rose, shamrock and thistle in yellow. There are a writing table of walnut wood, two small tables, and one on which meals are served during a journey. The floor is covered with an Indian carpet of dark blue, and the curtains are blue and white. There is a separate compartment in front for the the Queen's Highland attendant,

The night saloon is a larger carriage, divided into several compartments. The dressing room is decorated in the Japanese style, and the floor is covered with bamboo. There is a white metal bath and toilet service. The large basins on the washstand, which is covered with dark red morocco, are of the same material. The bedroom is decorated in gray and light brown, and contains two beds. The larger is occupied by the Queen, the smaller by Princess Beatrice. There is another compartment in which is stored the luggage needed during a journey, and the two maids who occupy it sleep on sofas.

A south bound Los Angeles express on the Southern Pacific was held up by train robbers near Fresno, Cal., Aug. 3. The robbers, two in number, one of whom was formerly a locomotive engineer, crawled over the tank to the engine cab and ordered the engineer and fireman to stop the train. The fireman was ordered to touch off with a lighted cigar the fuse of a dynamite cartridge which the robbers placed on the piston-rod of the left side of the locomotive. The explosion broke the piston-rod and, of course, disabled the engine. The robbers ordered the engineer to get off the train and walk a short distance along the track, while they proceeded to bombard the two doors of the express car by exploding dynamite cartridges, about eight in all, which tore the door into splinters and smashed the floor of the car. The men, masked and completely disguised, entered the express car, and covering the messenger with doubled-barreled shotguns, ordered him to open the Wells, Fargo & Co's safe. After being threatened with death if he refused he did so, and they took out the sacks of coin which were supposed to contain about $40,000.

The proposition to consolidate the car-building establishments of the country under one general management and ownership would work a good result if it should effect some degree of uniformity in the style and size of freight cars. Hitherto the variety of such rolling stock in the particulars indicated has been wonderful to contemplate. Every order for cars is different from any and every other order. Those who get out sills for cars know this to be the fact to their great inconvenience. Every order has its own specifications as to lengths and sizes, the divergence being designated by inches and fractions of an inch. It seems that the degree of absurdity involved in the specifications on car stuff received at the mills must be evolved from nothing but cranky brains. Apparently there is no reason why there should not be something near a uniformity of freight cars, with equal tonnage capacity, with a corresponding uniformity in the size of the bill stuff that enters into their framework.—*Northwestern Lumberman.*

The American Express Company recently received the following complaint:

"list week I bouhat a pare of schuws for my Vive and exsprest Teme Charzes pre payd amt 25c waz payd yedt had to pay seme agen Anklosed find Exspres Beal Please luck this mader up as I don't lick tu pay twise."

The Master Car and Locomotive Painters' Association.

The annual convention of the Master Car and Locomotive Painters' Association will be held at Detroit, Mich., Sept. 14. The following subjects will be discussed: Would it be practicable for railway companies to adopt the piece price system in the paint department upon all roads, and, if so, what plan and schedule would you suggest for doing the work, so as to cover all classes and parts of paintshop work upon locomotives and cars?

What is the best method of making putty for passenger car work—speed and durability combined, and is it advisable to use any coloring with lead in mixing hard drying putty?

In what manner should the outside surface of a passenger car be treated that has a good foundation, but requires recoloring, and should the varnish be removed before re-coloring? If so, how?

In what manner should requisitions for material in the railway paintshop be made to best observe the interests of the management; economy and suitable material being the main consideration?

Which are the most durable, light or dark colors, on passenger car bodies?

Which is the least expensive to maintain, yellow, Pullman color or Tuscan red?

What plan and material can be recommended to improve upon the general appearance of the equipment while in service, and also increase its durability?

What is the difference in cost of painting a passenger coach with yellow, Pullman color or Tuscan red?

The following queries, concerning the practice of members, will also be presented:

Do you paint your engine frames with color and then varnish them, or do you use asphaltum?

How do you clean the paint and varnish from glass?

In touching up and revarnishing a coach, is it economy to thoroughly clean and touch up the decks and trucks, or to paint them over?

How do you use gold and copper bronze for seat arms, heater pipes, etc., dry or mixed?

Which is the best gilding size, slow or quick?

In cutting in a coach with color, do you use it mixed in the same way when giving a general painting?

Do you give the sashes the last coat of varnish before or after they are put in?

Has any member ever found a paint remover that he felt sure would not injure the wood or subsequent painting?

Blue Paper Printing.

In addition to the information on this subject given in our last issue, we subjoin the following, also taken from *The Tradesman*.

To make a black line print on a white ground, proceed as described for making blue-line prints, or, in fact, the blue print may be made black at any time desired, even after it has been finished for a year. To do this, make up a solution of 1 part potash in 25 parts of water, and immerse the finished print therein, until it becomes of a dull, rusty color, which is because the iron oxide has been turned loose in the paper. If, now, the paper be immersed in a so-solution of tannin, say one once in 20 ounces of water, the tannin combines with the iron, and the lines in the paper are turned into good black ink, of a deep, blue-black cast, permanent and handsome.

The great trouble with this method is the great number of solutions that the paper has to be carried through, and to make black lines direct from the tracing, requires a similar process to that for blue lines, but some different chemicals are used. Three solutions are necessary, as in the blue line process, the only difference being that the citrate of iron and ammonia is replaced by iron sulphate. The formula is as follows:

Gum arabic, 25 parts.
Sodium chloride (common salt), 3 parts.
Iron perchloride (spec. grav. 45 B.), 10 parts.
Iron sulphate, 5 parts.
Tartaric acid, 4 parts.
Water, 47 parts.

The paper is either floated on top of this solution, or, which is more desirable,is coated with a sponge or a brush. Use as in making blue-line prints, and develop with either the red or the yellow prussiate of potash. In the developer the parts which did not receive the light turn a light green color, the rest of the paper remaining unchanged. The print is then to be washed with plenty of clean water, and then immersed in an acid bath, either of acetic, muriatic or sulphuric, which discharges all the color except where it was protected from the sunlight by the lines of the print. These lines are changed by the acid to a deep blue-black color, which is very permanent.

A St. Louis and San Francisco passenger train was held up near Augusta, Kan., on the night of Aug. 21, and the Wells Fargo express car was robbed. The four robbers were almost immediately afterward captured by the sheriff, and proved to be farmers, who were new at the business of train robbery.

Locomotive Fantasies.

It takes a good deal of effort to realize that the iron horse is not a veritable beast. You can hear him snoring while he stands still, lamenting as he starts, and yelping en route; he sweats, trembles, whistles, whinnies; now he hangs back, now he tries to run away. Long streaks of sparks fly from beneath his wheels, or his feet, as you choose, and his breath flies above your head in beautiful clouds of white vapor, to be shredded against the trees further on. One sees that nothing but such a prodigious beast could draw thus a thousand or fifteen hundred travelers—the whole population of a town—and do it at the rate of twelve leagues an hour. After our return, when, after nightfall, our engine passed near me on the way to its stable, the illusion was complete. One could hear it whining and complaining, in its whirlwind of flame and smoke, like a chafed and winded horse.

It is true the iron horse musn't be seen; when you see it all the poetry disappears. To the hearing, it is a monster; to the sight, it is nothing but a machine. This is the sad infirmity of our time—always bald utility; never beauty. If, 400 years ago, those who invented gunpowder had invented steam (and they were perfectly capable of it), the iron horse would have been otherwise fashioned and otherwise comparisoned; he would have been living, like a horse, and splendid as a statue. What a magnificent chimera our forefathers would have made of what we call the "boiler!" Can you imagine it? Of that boiler they would have made a scaled and monstrous belly, and enormous carapace; of the smokestack, a smoking horn, or a long neck bearing a mouth full of embers; and they would have hidden the wheels under immense fins, or great drooping wings. The cars, too, would have had a hundred fantastic forms; at night people would have seen passing through the towns now a colossal gargoyle with spread pinions, now a dragon vomiting fire, now an elephant, trunk in air, panting and trumpeting; all affrighted, ardent, smoking, formidable, dragging after them, as if they were their prey, a hundred other chained monsters, traversing the plains with swiftness and tumult. It would have been grand.

But we! We are good little shopkeepers, stupid and very pround of our stupidity. We comprehend neither art, nor nature, nor intelligence, nor fancy, nor beauty; and what we don't comprehend we pronounce useless, from the height of our littleness.—From a Letter of Victor Hugo.

Needs of the Illinois Central.

The Board of Directors of the Illinois Central Railroad has issued a circular to the stockholders setting forth a proposition, which is to be voted on at the annual meeting on October 12, that the capital stock of the company be increased from $45,000,000 to $50,000,000, by a new issue of shares.

The circular enters somewhat in detail into the requirements of the company. The site of the former passenger station in Chicago, owned jointly with the Michigan Central, having been found inadequate, the erection of a fireproof building for general offices, in connection with the passenger station, has been undertaken, at an estimated cost of $1,000,000, on a site to be provided by removing the Weldon shops. Although no contracts have been made, there is reason to expect that the railways using this company's tracks into Chicago will use the station, and pay adequate rents therefor. They are the Michigan Central and the Big Four.

The circular also speaks of the erection of new shops at Burnside, the necessity of elevating two and a half miles of track above the grade of the streets entering Jackson Park, at an estimated cost of $1,360,000, of which $350,000 will be borne by other interests, and the need of improved passenger service over the eight miles from Chicago to the site of the World's Fair. The equipment required, is estimated to be 50 engines and 500 coaches, costing $2,100,000.

Railway Car Construction.

(From the "Street Railway Journal.")

The work illustrates and describes in detail the construction of all the different types of steam cars employed in American practice. The matter is treated under twenty-six chapters and an appendix which gives all the standards adopted by the M. C. B. and M. M. associations, together with a code of rules governing the repair of freight cars. The illustrations are from scale drawings, and the accompanying matter not only describes minutely the material and methods of construction, but as well the office of every separate part. The description is interspersed with sufficient advice, and record of results and behavior of certain devices in actual practice, to relieve it of monotony, making the work intensely interesting even to an unmechanical reader. The work would seem to be a necessity to every foreman and mechanic employed in steam railway building and repair shops, as well as to inspectors employed in the rolling stock branch of the business. Street railway master mechanics will also find much valuable matter and helpful suggestions from the illustrations.

Counting Coins by Electricity.

In the London Mint, it is stated in the master's report recently published, a new counting machine for telling bronze coin has been erected in the bronze store. The machine has four distinct sets of counting apparatus, each of which can be worked independently of the others, and when all four are in full work upward of 3,000 pence can be counted per miuute. The coin to be told is raised to the level of two tables placed on a platform by a lift worked by an electric motor, which also drives the counting machines. A pair of these machines is fed from each of the two tables, the coins passing from the table down an inclined iron plane forming a flat hopper, from which they issue in single file through a channel of appropriate width. They are then gripped by a pair of india rubber driving wheels, which force the coins past the rim of a thin disk provided with recesses in its circumference to fit the circular edges of the coins. As the disk is thus made to revolve the coins are pushed forward, falling into a bag placed to receive them, and continue to advance until the counting wheel is automatically stopped and the bag containing the coins is removed.

High Locomotive Mileage.

The following table gives some figures relative to the annual mileage of locomotive in passenger service on the Pennsylvania Railroad. The greatest mileages made by one locomotive on this company's lines have been as follows:

Year.	Mileage.	Year.	Mileage.
1886	103,579	1890	91,680
1887	94,922	1891	92,252
1888	92,483	1891	98,875
1888	100,374	1891	123,152
1889	99,661		

The average mileage of locomotives in passenger service in the year 1891 was as follows:

	Miles.
Pennsylvania Railroad Division	39,415
United Railroads of New Jersey Division	35,796
Philadelphia & Erie Railroad Division	54,316
Average for three divisions, 1891	43,176

The Cowcatcher.

Cast your eagle eye on me;
Leaders there must always be.
I have got a massive brain,
I can stand a tug and strain;
See the engine and the train
As the meekly follow me;
Leaders there must always be.

It's a part of nature's plan
That I occupy the van.
Born to rule and born to lead;
Born to flourish and precede;
The momentum and the speed
Of the engine and the train
Are the products of my brain.

—*Kansas City Star.*

Washita oil stone rock is crystallized silica. The crystals are very small, and are formed in clusters with point ends nterlaced, leaving numerous cavities. These minute crystals are hexagonal in shape, with sharp points, and can be seen under a microscope when magnified about 100 times. They are harder than steel, and that is why whetstones cut from this rock will wear away and sharpen steel tools. Washita whetstones are called oil stones, because oil must be used to fill the cavities and float away the steel particles that are cut off the tools.

The peculiar geological formation from which these rocks are taken is not known to exist outside the State of Arkansas, where it occurs in many of the mountains of Saline, Hot Springs, Garland and Montgomery counties. These strata are in a vertical position, varying from nearly perpendicular to nearly horizontal, and have been considerably broken by upheaval or folding of the earth crust.

The Pullman Car Company is building a large number of new vestibuled sleeping cars of the latest design, calculated to accommodate World's Fair travel, and the increasing travel due to conventions of different societies. Also a large number of sleeping cars of a less expensive type are being built, more especially for World's Fair travel, the intention being to turn these cars into chair and parlor cars or day coaches when the Fair is over. These cars will have a 60-foot body with the Pullman strengthening and anti-telescoping devices used in first-class sleepers. They will not be vestibuled, but will have the new Janney-Buhoup platforms and couplers. The interior finish will be of mahogany. The arrangement of the berths will be the same as now used in Pullman sleepers, and they will contain 14 sections, with lavatories and saloons, but will have no smoking or drawing-rooms.

The Connelly gas motor, which has been in use experimentally on the North Side cable lines in Chicago is to be put into service quite extensively on those lines.

Motor cars fitted with the gas engine and apparatus are to be run on feeders to the cable lines, which are now aperated by horse cars, and are also to be run on the cable lines between the cable motors during the rush hours. It is stated that about 20 of the motors are now being built.

Railroads in the United States In 1891.

Poor's Manual of the Railroads of the United States for 1891 has just been issued, and gives the most reliable statistics available concerning the condition and operation of the railroads up to the close of the fiscal year, 1891.

We quote the following:

GENERAL EXHIBIT FOR FISCAL YEAR.

	Miles.
Length of track laid up to Dec. 31, 1891	170,601.18
Of which were completed up to the close of the fiscal years of the respective companies	167,909.07
Completed since close of their fiscal years	2,692.11
Net increase of mileage of all railroads in the United States in the calendar year 1891	3,898.49
Net increase of mileage of railroads reporting in the fiscal year 1891	4,488.73

STATISTICS OF OPERATIONS FISCAL YEAR 1891.

Miles of railroad operated (exclusive of elevated railroads)	164,261.91
Passenger train mileage	320,712,013
Freight train mileage	493,541,969
Mixed train mileage	16,948,394
Total revenue train mileage	831,202,376
Passengers carried	556,015,802
Passengers—mileage	13,316,925,239
Tons freight moved	704,398,609
Tons freight moved one mile	81,210,154,523

	United States. 1891. Miles.	1890. Miles.
Mileage of railroads	167,845.56	163,358.90
Second track, sidings, etc	46,683.39	44,792.99
Total track	214,528 95	208,151.89
Steel rails in track	174,775.14	167,457.58
Iron rails in track	39,753.81	40,694.31
	No.	*No.*
Locomotive engines	33,563	31,812
Cars—Passengers	23,083	21,664
Baggage, mail, etc	7,368	7,253
Freight	1,110,286	1,061 952
Total revenue cars	1,140,737	1,090,869
	Miles.	*Miles.*
Miles of R. R. operated	164,261.91	157,976.46
Rev. train mileage:		
Passenger	320.712,013	297,244,707
Freight	493,541,969	482,900,422
Mixed	16,948,394	13,780,016
Total	831,202,376	793,925,145
Passengers carried	556,015,802	520,439,082
Passenger mileage	13,316,925,239	12,521,565,649
Tons of freight moved	704,398,609	691,344,427
Freight mileage	81,210,154,523	79,192,985,125
	$	$
Traffic earnings—Pass	290,799,696	272,320,961
Freight	754,185,910	734,812,733
Miscellaneous	80,549,209	71,692,645
Total	1,125,534,815	1,078,835,339
Net earnings	350,807,370	341,666,369
Receipts from other sources	101,139,823	108.046,387
Total available revenue	451,947,193	449,712,756

The total number of miles of railroad in the United States at the close of 1891 was 170,601, of which 4,471 miles were constructed during the year.

	Road worked. Miles.	Gross earnings.	Net earnings.	Gross earnings per mile.	Net earnings per mile.	Increase or decrease over preceding year. Road worked. Miles.	Gross. earnings.	Net earnings.	Gross earnings per mile.	Net earnings per mile.
1884..	115,704	$777,396,317	$270,890,955	$6,663	$2,318	5,290	*$46,376,607	*$27,476,330	*$798	*$384
1885..	123,320	772,568,883	269,493,931	6,265	2.185	7,648	*4,827,434	*1,397,024	*398	*133
1886.	125,185	829,940,836	300,603,564	6,570	2.376	1,865	57,371,953	31,109,633	305	191
1887..	137,028	940,150,702	334,989,119	6,861	2,444	11,843	110,209,866	34,385,555	291	68
1888..	145,387	960,256,270	301,631,051	6,540	2,045	8,359	*20,105,568	*33,358,068	*321	*399
1889..	153,725	1,002,926,059	322,122,721	6,524	2,095	8,338	42,669,789	20,491,670	*16	50
1890..	158,037	1,090,642,560	346,921,318	6,901	2,195	4,312	87,716,501	24,798,597	377	100
1891..	164,324	1,138,024,459	356,209,880	6,926	2,168	6,287	47,381,899	9,288,562	25	*17

* Decrease.

STATISTICS OF ROLLING STOCK EQUIPMENT.

Statement showing the rolling stock owned by the railroads in the United States (including elevated railroads) at the close of their respective fiscal years, 1877 to 1891, inclusive:

Year.	Locomotive engines.	Revenue Cars. Passenger.	Baggage, mail and express.	Freight.	Total.
1877	15,911	12,053	3,854	392,175	408,082
1878	16,445	11,683	4,414	423,013	439,109
1879	17,084	12,009	4,519	480,190	496,718
1880	17,949	12,789	4,786	538,255	556,930
1881	20,116	14,548	4,976	648,295	667,819
1882	22,114	15,551	5,566	730,451	751,568
1883	23,623	16,889	5,848	778,663	801,400
1884	24,587	17,303	5,911	798,399	821,613
1885	25,937	17,290	6,044	805,519	828,853
1886	26,415	19,252	6,325	845,914	871,491
1887	27,643	20,457	6,554	950,887	977,898
1888	29,398	21,425	6,827	1,005,116	1,033,368
1889	31,041	22,885	7,053	1,051,169	1,081,107
1890	32,241	22,958	7,253	1,061,970	1,092,241
1891	34,022	24,497	7,368	1,110,304	1,142,169

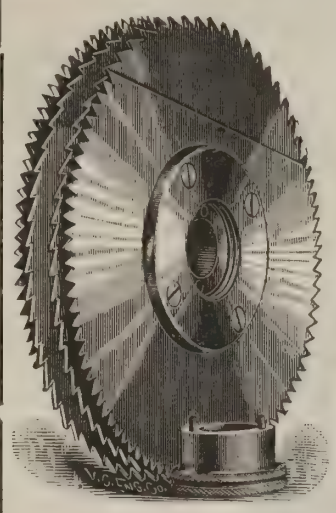
Compared with 1890 there was an increase of 1,781 locomotives; 1,539 passenger cars; 115 baggage, mail and express cars; and 48,334 freight cars—a total increase of cars of 49,928.

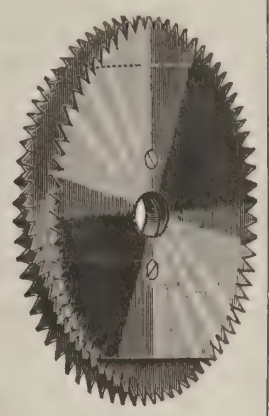
In the foregoing statement are given the mileage, gross and net earnings of all the railroads in the United States (including elevated railroads in New York and Brooklyn) for the eight years 1884–1891, inclusive, and deductions therefrom.

Compared with 1890, gross earnings increased $47,881,899, to which increase the elevated railroads contributed $682,423 the remainder, $46,699,476, being the increase upon the surface roads, made up by increases of $18,478,735 in passenger earnings, $19,364,177 in freight earnings, and $8,856,564 in mail, express, and other miscellaneous earnings.

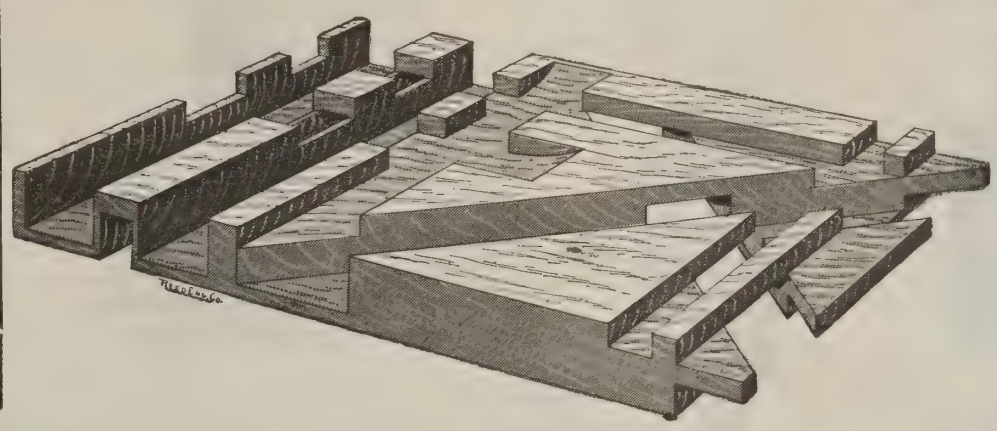
Dado or Grooving Saw Heads.

The accompanying illustrations show the construction of solid and adjustable dado and grooving saw heads as manufactured by the Fox Machine Company, of Grand Rapids, Mich. These heads have an unusually large cutting surface and do not tear cross grained stock or where they leave the cut. Each tooth of the center saw is a narrow chisel tooth which removes the intervening stock yet does not tear it like a wide knife. The manufacturers are meeting with much success in placing them in many of the largest and best wood working institutions in the country.



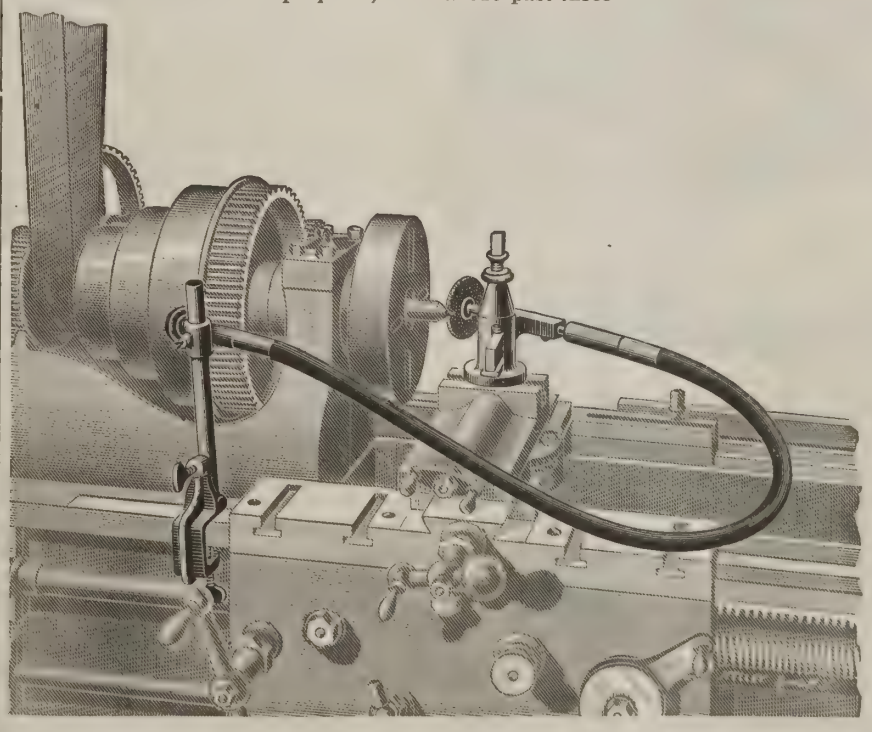


The following cut shows a small sample of work that can be done with these tools.



The Stow Flexible Shaft.

The rapid growth of the Stow Manufacturing Company, of Binghamton, N. Y., inventors and manufacturers of the Stow flexible shaft for all purposes, within the past three years, is simply one of the many illustrations of the fact that a firm that makes what the people want, takes pains that its tools shall be perfectly constructed, advertises freely and hustles for business, will get it.



The flexible shaft first took a place as a standard tool in dentistry, then gradually obtained a foothold among machinists, and now the flexible shaft is considered a great convenience in many well-regulated shops.

As a result of largely increased demand, the Stow Manufacturing Company is just beginning to feel at home in one of the handsomest and best appointed shops in the State. They have perfected many new appliances for use with the flexible shaft, notably the center grinder, which we illustrate herewith. Its advantages are evident. They have also made a great improvement in the shaft itself, adding much to its flexibility and durability, also a low speed motor which they have devised for use with the shaft.

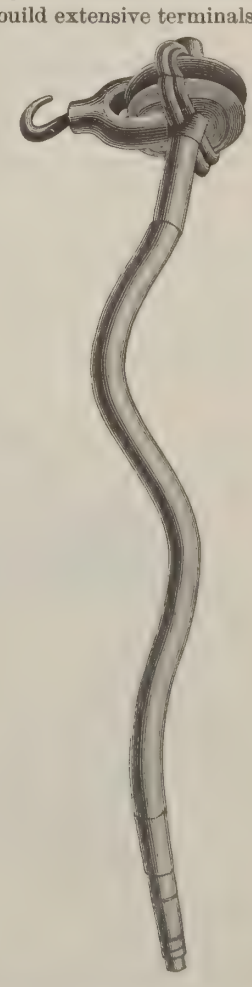
Bell's Improved Steam Hammer.

Various systems have been invented and adopted to meet the want of a power hammer in shops, but the cost has been the great obstacle to the introduction of the steam hammer. This obstacle is largely overcome in the improved steam hammer illustrated herewith, and manufactured by David Bell, of Buffalo, N. Y. It is of a very simple construction, having a single column standard with bed-plate and cylinder cast in one piece. Either of the four sizes in which these hammers are made will strike a heavy or light blow, as required, and can be worked either "double acting" or "single acting," the change being easily and quickly affected.

The diameter of the cylinders of the hammer illustrated is 10 inches, stroke 22 inches, and it will strike 150 six thousand-pound blows per minute.

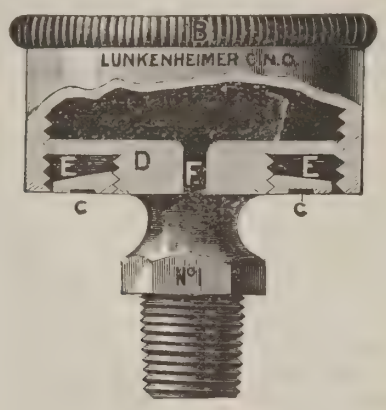
The importance of a good dust guard to prevent the entrance of gritty matter into journal boxes is very well understood. One of the best devices to accomplish this purpose is the White dust guard, made by the White Car Lubricator Company, of Concord, N. H. It consists of two pieces of pressed wood pulp impregnated with oil and resin, each of the ordinary shape of dust guards. In attachment and arrangement of springs they are made to slide easily in contact with each other, insuring that the dust guard will always closely fit the top and bottom of the journal, and making provision for wear. They are in successful operation on several large roads.

Preparations are being made by the Baltimore & Southwestern Terminal Company to build extensive terminals in Cincinnati for use of the Baltimore & Southwestern Railroad. The improvements will include freight houses and yards, roundhouses and car shops. Freight yards and repair shops will be established outside the city. In addition a large freight house will be built in the center of the city.



Lunkenheimer's Automatic and Plain Grease Cups.

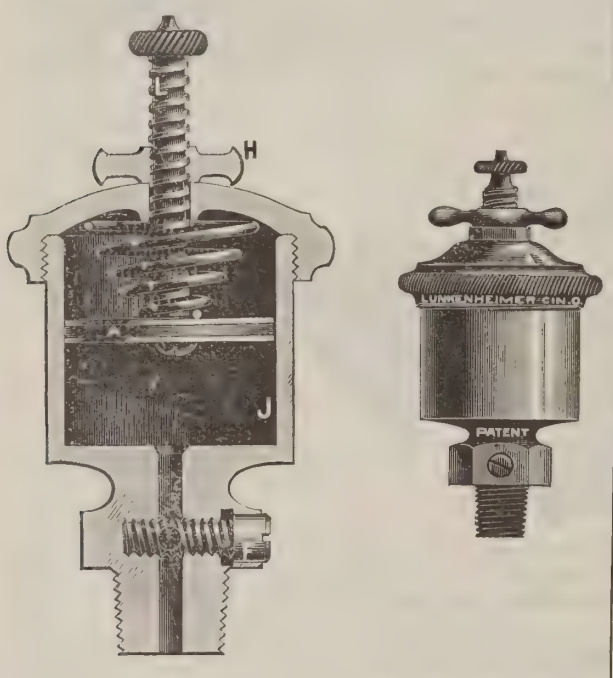
The Lunkenheimer automatic (spring) grease cup is provided with a leather packed plunger, which can be raised from the outside by means of the thumb-nut. The plunger is so constructed that it is easily raised when the cup is empty.



The rate of feed is regulated by the set screw *F*, and if it is desired to stop the feed entirely this is done by turning the thumb nut *H* down to the cover, thereby taking the tension off the spring.

The plunger *A* is provided with a soft leather washer, which insures a tight joint and smooth working.

The plain grease cup is well adapted for jarring machinery, as it will not jar apart nor allow the cover to unscrew itself.



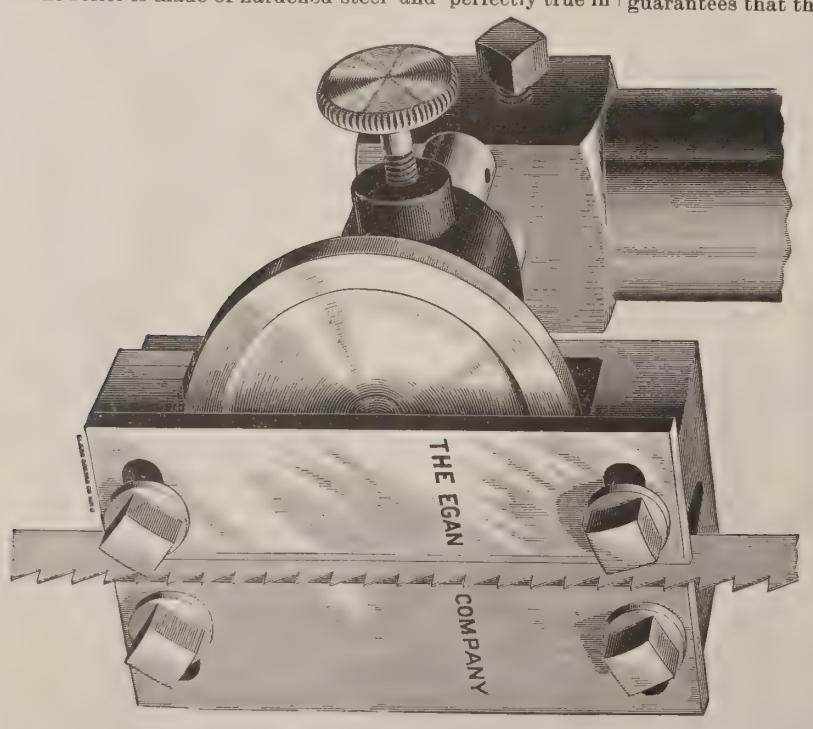
The leather washer *E* prevents the grease from leaking out of the cup, and can easily be replaced when worn out.

These cups are manufactured by the Lunkenheimer Brass Manufacturing Company, Cincinnati, O.

Improved Band Saw Guide.

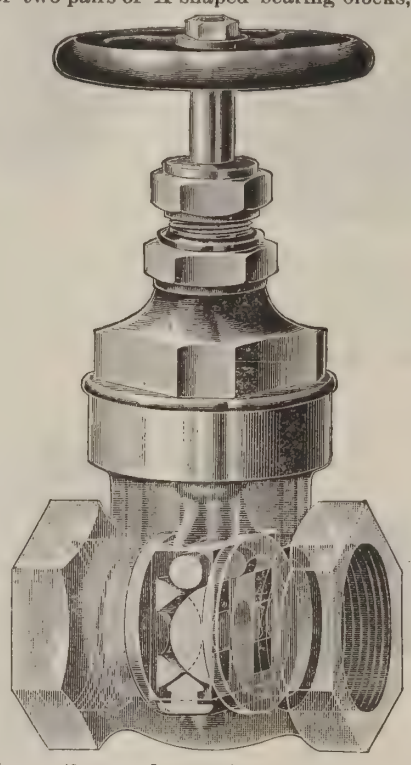
The cut herewith shows an improved band saw guide made by The Egan Co.,of Cincinnati,O. With this guide it is claimed a good blade can be worn from one inch to one-eighth of an inch without breaking, except by accident.

The roller is made of hardened steel and perfectly true in size and shape, and is attached to a spindle of the same material running in a close fitting sleeve so arranged that all bearings are easily oiled and secure from escape. The frame holding the side guides is adjustable to and fro for the various widths of blades by means of the thumb-screw as seen in the cut. The back of the saw blade has a very long bearing across the face of the roller, thus providing fo the least amount of friction and spreading it over the largest surface possible, which thereby prevents the crystallization that causes the breakage of saws through heat and friction. The side guides are extra long and of hardened steel, supporting the sides of the saw blade in the most approved manner, which results in an improved action of the saw in many ways, especially with respect to breakage and twisting. These side guides are adjustable sidewise, with a wrench, and are movable to the blade or from it as desired to suit the various widths of saws, so that at all times the saw blade is held rigid the full width and close to the teeth of the same.



Mobile Wedge Gate Valve.

The Ross Valve Company, of Troy, N. Y., have recently placed upon the market a new gate valve known by the name of the Mobile wedge. It was exhibited at the conventions in June, and in the accompanying illustration we show the manner in which it is constructed. The special feature of the valve is the rolling action of the movable wedge, by means of which a uniform pressure is exerted over the entire back of the gate, and this is accomplished without any grinding of the valve faces by sliding contact. The mechanism consists of two pairs of X-shaped bearing blocks, a rolling



wedge between them and a seating plunger which bears in the center of the valve case when the valve is closed, as shown in the cut. The pressure to seat the valve is equally divided between four points on each disc or gate, and a positive movement seats them without sliding them on their faces. Each gate or disc is hung on trunnions and is free to revolve, thereby seating in a different place each time the gate is operated. This will prolong the life of the valve and assist in keeping it tight. It is operated much more easily than ordinary gate valves, especially in the larger sizes. Those who have used the valve have been much pleased with its action, and though it has been upon the market but a s hort time it has become a favor ite with those who are acquainted with its merits. It is made in brass in sizes from one to three inches, and in iron with brass mountings in sizes from two to sixteen inches.

Mr. Arthur Pennell has just closed a contract with the Union Pacific Railroad to erect, maintain and operate a plant for treating the water at Bitter Creek, Wyo., and guarantees that the water shall be free from scale, corrosive matter or tendency to foam. The Bitter Creek water contains per U. S. gallon: Sulphate of soda, 25.05 grains; carbonate of soda, 48.90 grains. The plant is to be capable of furnishing water at the rate of 50,000 gallons for each 24 hours.

The patent office has issued three patents on valves for automatic air-brakes to the Boyden Brake Company, of Baltimore. The application for one of these patents has been pending since September, 1889. The patents relate to the triple valve manufactured by this company. The Boyden Company have for nearly three years been making valves embodying the features of these patents, and a large number are now in use on various railroads. Besides being simple in construction, these valves differ essentially from other makes and do not include an auxiliary valve. Some of these valves have been constantly in use mor than two years, and two of the railroads using them during the period named have lately given the Boyden Brake Company orders for brakes for a thou and cars. Besides the patents above-mentioned the Boyden Company own twenty others relating to various parts of their air-brake system.

In our description in the last issue of the elevated railroad cars in Chicago we neglected to mention that they were mounted on the Pickering springs, manufactured by the Pickering Spring Co., Limited, of Philadelphia. Forty ad ditional coaches are now being built for the elevated road and Pickering springs will be used under all of them.

Automatic Brake Slack Adjuster.

The importance of a practical device for compensating for the wear of brake shoes and automatically keeping the travel of air brake piston uniform, is now very generally appreciated by railroad men. The Hinckley adjuster, manufactured by the Hinckley Brake Company, of Trenton, N. J., although but a short time on the market, is already in use in passenger service on several prominent roads. It consists of a pipe swivel or turnbuckle, operated automatically by the application and release of the brakes and shortening up the rod in which it is inserted whenever the piston exceeds its prescribed stroke. From the nature of the device it is adapted equally well for attachment to any tension member of the brake lever system, thus permitting its use either at the center of car beside the cylinder, for which purpose one adjuster only per car is required, or, when preferred, it is placed in the bottom brake rod connections, one at each truck.

A Heavy Casting.

The Standard Steel Casting Company, of Thurlow, Pa., have recently cast successfully a steel stern post weighing 49,520 pounds for the United States cruiser "Columbia." This is a very large and intricate casting, probably as large, if not larger, than any ever furnished abroad, and is the largest ever attempted in the United States, and the most difficult. The casting was found to be absolutely perfect in every detail, and possessing high physical characteristics. This company has furnished all the hull castings required in the construction of the vessels of the new navy, but never had anything as difficult to "tackle" before. Physical tests of the casting showed the tensile strength to be 75,800 pounds, elastic limit 35,000 pounds and elongation 21.76 per cent.

A locomotive on an inclined railroad at Tim Gray's Run, near Williamsport, Penn., became unmanageable Aug. 25, and descending with great rapidity, turned over into a ditch. The engineer was killed and the fireman fatally injured.

A coin dealer recently received a collection of exceedingly unique coins, which it is proposed to exhibit at the World's Fair. The coins came from Sweden, where they circulated in the sixteenth century. They bear more resemblance to pieces of boiler iron after an explosion than money. The coins are great flat pieces of copper, cut into very poor squares. The smallest coin is four inches square, and worth 30 cents, and the largest over a foot square and with a face value of $4. Each slab of copper is stamped in several places with an inscription, giving its date of issue and its denomination. The largest weigh over four pounds. These enormous and cumbersome coins were the result of an absurd craze which prevailed several hundred years ago regarding the exclusive use of copper for money. It carried the coinage of copper to absurd lengths and the people discarded its use.

Our Directory.

Brooklyn Elevated.—E. Hedley has been appointed Master Mechanic.

Chicago & Eastern Illinois.—R. G. Matthews has been appointed Superintendent.

Cincinnati, Hamilton & Dayton.—G. R. Balch has been appointed Purchasing Agent, vice C. W. Waldo, appointed assistant to President.

Cleveland, Lorain & Wheeling.—P. Bruner has been appointed Superintendent.

Concord & Montreal.—E. F. Maun, Superintendent, died at Concord, N. H., Aug. 19, 1892.

Great Northern.—J. O. Patte has been appointed Superintendent of Motive Power.

Lehigh Valley.—James Cunningham has been appointed Master Mechanic of the Buffalo division.

Louisville, New Albany & Chicago.—J. Ewan has been appointed Superintendent Indianapolis division. Office at Monon, Ind.

Newport News & Mississippi Valley.—M. B. Cutter has been appointed General Superintendent.

Ohio Southern.—W. Ramsey has been appointed Superintendent, vice J. H. Van Tassell, resigned.

Pecos Valley.—J. G. Harris has been appointed Superintendent, vice W. H. Vaughan, resigned.

Philadelphia & Reading.—Mr. I. A. Sweigard has been appointed General Manager. J. Cunningham has been appointed Master Mechanic of the Buffalo Division.

Pittsburgh, Akron & Western.—J. H. Sample has been appointed Superintendent.

Pittsburgh, Marion and Chicago.—George W. Dixon has been appointed Superintendent with headquarters at New Lisbon, O. He virtually succeeds N. F. Wood, whose title was general manager.

Pullman Palace Car Company.—A. W. Sargent has been appointed Division Superintendent at Jacksonville, Fla.

San Antonio and Aransas Pass.—G. A. Hancock has been apointed General Master Mechanic.

St. Louis & Hannibal.—J. A. Gordan has been appointed General Manager. T. W. Kennedy, Superintendent, has resigned.

Southern Pacific.—J. L. Frazier has been appointed Superintendent of the Fresno division. J. H. Whiteed has been appointed Superintendent of the Truckee division.

Employment.

WANTED—A position as Foreman Painter in a Car Works by a competent man of 16 years' experience. Can furnish first-class reference as to character and ability. Address R. Q. P., office NATIONAL CAR AND LOCOMOTIVE BUILDER, New York.

WANTED.—A position as general foreman or master car builder by a man of 23 years' experience in car work and 12 years' experience as foreman of railroad car shops. Address N. J. S., care of NATIONAL CAR AND LOCOMOTIVE BUILDER.

NATIONAL CAR AND LOCOMOTIVE BUILDER

OCTOBER, 1892.

CONTENTS.

The pay of firemen on the Chesapeake & Ohio has been increased 2½ per cent.

The Southern Pacific Railroad has withdrawn from the Western Traffic Association.

The Burton Stock Car Company, of Boston, has ordered 1,000 cars for immediate delivery.

The railroad to Pike's Peak has carried more than 20,000 persons during the present season.

The first of the Northern Pacific's new line of steamers for Yokahama and Hong Kong left Tacoma Sept. 26.

Salton Lake, which so suddenly appeared a year ago in the Colorado desert, has entirely disappeared, and its bed is now covered with luxuriant verdure.

The Ulysses and Pine Creek Railroad Company, of Potter County, Pa., has been granted a State charter in Pennsylvania. The company has a capital of $65,000.

The aggregate length of railway in operation in the Argentine Republic last year was 7,676 miles. The cost of construction and equipment had been £71,800,000.

The average price of coal on the tender to the different railroad companies terminating in Jersey City, taking anthracite and bituminous together, is $2.50 per ton.

A charter has been granted to the Philadelphia & New England Railway Company, capital $2,000,000. The company proposes to build a line from Stroudsburg to Port Jervis.

The Brotherhood of Locomotive Firemen have indorsed Thomas Nilau, an engineer on the Delaware, Lackawanna & Western Railroad, for Railway Commissioner of New York State.

Twenty-five Vauclain compound engines of the Forney type, similar to those now in use on the Chicago & South Side Elevated Railroad, have been ordered from the Baldwin Locomotive Works for that road.

The main railway station within the World's Fair grounds where all excursion trains will discharge their passengers will be a handsome structure costing $225,000, and will accommodate 25,000 persons at one time.

The Central Railroad of New Jersey has now in use pneumatic block signals for a distance of 31 miles between Jersey City and Bound Brook. The power stations are located at Communipaw, Roselle and Greenbrook.

The shipments of green fruit from California this year have exceeded all previous shipments, amounting to an average of forty-five and a half carloads per day. Special trains run on express time are used exclusively for this traffic.

A plan is on foot to change the Merchants' Bridge at North St. Louis so that foot passengers and teams, as well as electric cars, can cross. The expense is estimated at $250,000, of which the residents are asked to subscribe $150,000.

The Pullman Palace Car Company is now building a complete train in duplicate of the Chicago Limited that runs over the Pennsylvania Railroad. It will be exhibited at the World's Fair. The cost of the cars comprising the train will be $140,000.

As a freight train was running between New Hartford and Winsted, Conn., on the New England Division of the Philadelphia & Reading Railroad, Sept. 19, a car filled with powder exploded with terrific force, injuring two brakemen and wrecking 12 cars.

The Louisiana Division of the Southern Pacific Railroad reports that the shipment of rice over that line this season will in all probability reach 50,000 tons. The rice traffic for the past four years has been: 1888, 3,500 tons; 1889, 8,000 tons; 1890, 15,500 tons; 1891, 32,500 tons.

Two New York Central car repairers were instantly killed while at work in the "cripple yards" at East Buffalo, Sept. 21. They were under a car when a switch engine ran into it, and the two unfortunate men were crushed. Three others escaped with slight injuries.

At a cost of over $100,000 the Great Northern road will build a new steel bridge over the Columbia River. It will have two spans, and the masonry work will be of granite. As the channel which this bridge will span is over 150 feet deep the structure will be built in the most substantial manner.

A broken wheel under a car in a freight train on the New York Central caused a bad wreck near Amsterdam, N. Y., at midnight, Sept. 19. The wrecked cars covered all four tracks, completely blocking traffic, and trains were sent east and west by way of the West Shore road. No one was hurt.

The Elevated Terminal Railway Company, of Chicago, filed articles of incorporation in the office of the Secretary of State, Sept. 21. The capital stock is $7,500,000, and the incorporators and first board of directors are Walter C. Gunn, John H. Miller, Andrew Gillespie, Paul Brown and William G. Adams.

An old almanac for 1814 gives the following as the rates of postage prevailing at that time: "For every single letter by land for 40 miles, 8 cents; 90 miles, 10 cents; 150 miles, 12½ cents; 300 miles, 17 cents; 500 miles, 20 cents, and for more than 500 miles, 25 cents. No allowance to be made for intermediate miles."

An agreement has been made between the Illinois Central and Baltimore & Ohio companies, by which all other lines desiring trackage facilities over their tracks to the World's Fair grounds will be charged pro rata per mile on the rates that are effective at the time, with a minimum charge of one cent a mile.

Yardmaster Bristol, of the Delaware, Lackawanna & Western at Hoboken, has a valuable railroad relic in an old time table of the New York & Erie road, now New York, Lake Erie & Western. The schedule was in effect in May, 1852. This is a tip for the industrious Chief of the Transportation Department of the World's Fair.

Commissioner Whitman's statement just issued gives the total earnings of the Michigan railway companies for June at $8,659,189, an increase of $978,974 over the earnings of June, 1891. The total earnings from Jan. 1 to July 1 were $48,776,347. For the same period last year they were $42,667,528. This is an increase of 14.32 per cent.

The Illinois Central has contracted for the following cars: Wells, French & Company, 175 to 200 special World's Fair cars; Indiana Car and Foundry Company, 100 special World's Fair cars; Madison Car Company, 100 fruit cars, 10 box and 10 coal; Missouri Car and Foundry Company, 100 coal cars; Mount Vernon Car Company, 100 box cars.

The stockholders of the New York, Providence & Boston Railroad Company held their annual meeting Sept. 21. The gross earnings for the year were $3,207,418; total expenses, $2,654,515; net earnings, $552,902; $396,526 has been expended on construction, and 6,500,351 passengers were carried during the year, an increase of about 214,000.

It is proposed to reduce the present distance by water between Baltimore and Philadelphia which is now 122 miles, to 112 miles by an internal waterway scheme. Canals to connect with the Chesapeake and Delaware and the Delaware and Raritan canals are to be cut with a mean depth of 27 feet and a width of 130 feet. The cost is estimated at $2,358,000.

Chief Smith, of the Department of Transportation, has secured the promise of two monster locomotives to adorn the entrance to the Railway World's Fair passenger station, inside Jackson Park. The Rogers locomotive works has agreed to furnish one and the Brooks company the other. Each locomotive will weigh 160,000 pounds, and be mounted on a pedestal. They will stand one on each side of the main entrance.

The first two cars of 1892 hops were shipped from Sacramento, Cal., on the night of Sept. 3, via the "Sunset" route, connected with the steamer "Excelsior," sailing for Algiers, La., on Sept. 10, and arrived at New York at 3 P. M., Sept. 16. The cars were discharged and the freight ready for delivery at 7 o'clock on the morning of Sept. 17. The time between Sacramento and New York was thirteen days.

To produce tough fibrous copper castings, free from blowholes, Mr. T. D. Bottome, of New York, has patented the addition of 0.1 per cent. of metallic sodium. In melting the copper there is used a covering or flux of one part of sodium carbonate, two parts powdered anthracite coal and a small quantity of common salt. The sodium is put under the surface of the melted copper and the whole thoroughly stirred.

Members of the Brotherhood of Locomotive Engineers in Pennsylvania are advocating a proposed State law to regulate the employment of telegraph operators. The bill provides that all operators employed on railroads in the State shall have at least one year's experience, shall not be under 20 years of age, and, where block signals are used, before securing a position they must first become familiar with the system.

Charles H. Strain, an engineer on the Pittsburgh, McKeesport & Youghiogheny Railroad, convicted in Pittsburgh of misdemeanor, was recently sentenced to pay a fine of $100, costs of prosecution and 48 hours in jail. On May 1 Strain forgot his running orders and collided with another train, resulting in the death of Fireman E. G. Stewart. The Court ordered that Strain be acquitted on the charge of murder or manslaughter.

An electric riveting machine is being introduced by a Paris firm. Essentially the principle of the machine is that of the hydraulic jack; a small ram being moved by the motor, brings a heavy pressure on the larger area of the ram, which does the riveting. The machine is intended for outdoor work where hydraulic pipes may be difficult to run, but wires from a dynamo to the riveter motor can be easily laid down.

The aggregate length of railway in operation in France at the close of March, 1892, was 21,643¼ miles, showing an increase of 516¾ miles, as compared with the corresponding mileage in operation at the close of March, 1891. The aggregate revenue collected upon all the French railways in the first three months of this year was £10,271,400, as compared with £10,282,840 in the corresponding period of 1891, showing a decrease of £11,440 this year.

On Aug. 28 a monument was unveiled at Essen for the late Alfred Krupp, erected from funds collected among the workmen of the Krupp establishment. On behalf of the men Mr. Röder, one of the engineers, spoke of the good relations between the men and their employer. Mr. Krupp, having thanked the men for the monument, informed them that he had decided to give a sum of $125,000 for the building of free residences for old workmen and their widows.

The Union of French Railway Servants held its annual meeting last month at Lens. A resolution was carried embodying the following desiderata: 1. Railway employés and workmen to receive a commission at the end of the year's service; 2. A pension equal to half pay to be due after 20 years' service; 3. The eight hours day, with one day of rest in the week; 4. Full pay to run on in case of illness; 5. The minimum salary of any railway man to be 4s. a day.

At an important conference of directors of the Central Railroad and Banking Company of Georgia in New York City recently steps were taken looking to a reorganization of the company, the readjustment of the floating debt and the discharge of the receiver. While no definite financial arrangements have yet been made, it is said by friends of the company that there is an excellent prospect for an early rehabilitation of the company's finances. New and important interests are declared to have been enlisted in the welfare of the property.

Since the Homestead mill resumed operations with new men the strikers have tried to assure themselves that there was little or no work being done, but a story now going the rounds shows that at least one striker realizes the situation. A newspaper representative, during a recent visit to that town, met a striker, and, pointing to the works, remarked: "Aren't they making a big bluff in there?" "Making a bluff, h——!" answered the striker, "they're making beams."

There were four fires in the Central Pacific snow sheds at Summit on the night of Sept. 9. The Summit fire train, while fighting flames, became surrounded with fire and had to be abandoned. The engine and water cars were wrecked by the flames. The Blue Cañon water train was hurried to the scene, but a new fire started west of the train, and for a time there was imminent danger that this train would also be destroyed. The water train from Rocklin was sent up early next morning and the flames got under control. Twenty-one hundred feet of sheds and track were destroyed and four passenger trains blockaded.

The Pennsylvania Railroad exhibit at the Columbian Exhibition is to cost between $60,000 and $70,000, and is in charge of General Superintendent of Motive Power T. N. Ely. The main exhibit will be on a plot of nearly three acres, and will include a section of four-track road, laid with the new standard 100-pound rail, in 60-foot lengths, on the standard roadbed. On this track will be the latest type of locomotive built by the company and the first engine used, the "John Bull," now in the Smithsonian Institution. A station will be shown, with ticket office, waiting room, overhead bridge, etc. This station will be used for other exhibits of the company. Another separate exhibit will be placed in one of the Exposition buildings.

The Jaffa and Jerusalem Railroad.

The first locomotive to reach Jerusalem arrived there over the Jaffa & Jerusalem R. R. on Aug. 21, and nearly a month later, Sept. 20, the road was formally opened for traffic and the running of regular trains established. The terminus of the road lies on the west of the road to Bethlehem, not far from the south end of the Montefiore Almshouses. The Wadi Rababeh, perhaps better known as the Valley of Hinnom, will separate the railway station from the town, and it will thus be about half a mile from the Jaffa Gate. The Temple site, with Gethsemane and the Mount of Olives, is on the opposite side of the town, and will not be much disturbed by the noise of the railway. It may be mentioned that the Wadi Rababeh means the "Valley of the Lute." The Arabs should now call it—if Arabic words can be found for the sentence—"The Wadi of the Whistle." During six years the population of Jerusalem has risen from 30,000 to 80,000. This has been greatly due to the Czar's persecution of the Jews, and to the Sultan having given Russian Jews who emigrate to Palestine proprietary rights in the agricultural settlements in which they are being planted. Six hundred houses are being built outside the city walls.

Locomotives in Uruguay.

The accompanying engravings of locomotives in Uruguay are reproduced from photographs kindly sent us to by Mr. Frank Hudson, Locomotive Superintendent of the Central Railroad of Uruguay.

Bituminous coal imported from England is the fuel used, and as it ranges in price from ten to fifteen dollars per ton, its economical consumption is a matter of much solicitude. A large number of the locomotives employed are compound engines of English build. As shown in the engravings, two different classes are used, the four-wheel coupled engine with bogie truck for passenger service, and the six-wheel coupled engine with pony truck for freight service. The modifying influence of American practice is shown in the resemblance of these engines to ordinary American eight-wheel and mogul locomotives. The resemblance is increased by the orthodox American headlights and pilots, with which the engines are adorned.

The old American engine shown looks as if it is far from home and has lived to see the time when it must be counted outside of the swim. The only information Mr. Hudson vouchsafes in regard to it is "four like this; light on repairs but heavy on coal, and laid up on that account." Observing the size of the boiler, the cause is plain. Many such engines are in use upon American railroads to-day, and the cheapness of fuel or a disregard of the cost of its consumption are the only reasons for their use.

Following is given the general dimensions of the two classes of compound engines:

Four-Wheeled Coupled Passenger Engine.
Messrs. Beyer, Peacock & Co., Builders.

Cylinders.		Diam. of Engine Wheels.			Diam. of tender wheels
Diam.	Stroke.	Bogie.	Driving.	Trailing.	
16-in. and 23-in.	22-in.	2 ft. 9 in.	5 ft.	3 ft.	3 ft.

Capacity of Tank.	Capacity of Coal Bunker.		Heating Surface.			Grate area.
			Firebox.	Tubes.	Total.	
Galls. 2,000.	Tons. 4	Cwt. 5	Sq. ft. 87	Sq. ft. 743	Sq ft. 830	Sq. ft. 16

Automatic Vacuum Brake.

Six-wheeled Coupled Goods Engine.
Messrs. Beyer, Peacock & Co., Builders.

Cylinders.		Diam. of Engine Wheels.				Diam. of tender wheels.
Diam.	Stroke.	Bogie.	Leading.	Driving.	Trailing.	
17½-in. and 25-in.	24-in.	2ft. 9 in.	4 ft. 6 in.	4 ft. 6 in.	4 ft. 6 in.	3 ft. 2 in.

Capacity of Tank.	Capacity of Coal Bunkers.		Heating Surface.			Grate area.
			Firebox.	Tubes.	Total.	
Galls. 1,700	Tons. 4	Cwt. 5	Sq. ft. 86	Sq. ft. 930	Sq. ft. 1.016	Sq. ft. 17½

Combined Steam and Automatic Vacuum Brakes.

COMPOUND FREIGHT ENGINE, URUGUAY CENTRAL R. R.

AN OLD AMERICAN LOCOMOTIVE, URUGUAY CENTRAL R. R.

COMPOUND PASSENGER ENGINE, URUGUAY CENTRAL R. R.

With a capital of $80,000 the Catskill & Tannersville Company has been incorporated in New York to build a narrow gage road. It will be seven miles long, and will extend from the western terminus of the Otis Elevating Railroad to Tannersville, with a branch line from Haines Falls to Santa Cruz Park.

A Good Record.

The Southern Pacific road is fortunate in having a good set of locomotive engineers. Diverse makes of locomotives, numerous mountain grades, bad feed water and very expensive fuel are the disadvantages under which the greater part of this road is operated, and they are such as to make good engineers exceptionally valuable employees. Whether the disadvantages named have resulted in weeding out most of the inferior runners who were hired or promoted, or whether being carefully instructed by the management and appreciating the exigencies of the case, the fact remain that they generally rise to properly meet them, the engineers of this road excel in general efficiency those of other American railroads, with but very few exceptions.

Records of 15 and 20 years of continuous service are quite common among these men. One of the best, if not the best, of such records is given herewith, being sent to us by the Superintendent of Motive Power and Machinery, Mr. H. J. Small. The maker of the record is Mr. S. C. Clark, one of the oldest and most valued engineers in the employ of the S. P. Co.

Commenced running an engine on S. P. Railway, Aug. 22, 1868.	
In service as engineer to Aug. 22, 1892	24 years.
Mileage made to Aug. 22, 1892	1,000,051
Average mileage per year	41,669
" " " month	3,472.5
" " " day	114.4
Drawn for service as engineer	$38,800.00

Mr. Clark has had but two accidents during his long term of service, for one of which he was suspended 30 days and for one of which he was not held responsible. He never missed a pay roll. He is at present 57 years old and believes he is good for ten years more of good careful work. A representative of the National Car and Locomotive Builder rode on this man's engine some time ago and noticed that his methods of management, unlike most old locomotive runners, were in accord with the best modern practice. Such engineers can not live too long or be too highly appreciated by their employers.

The plant of the United States Rolling Stock Company, at Hegewisch, Ill., was on Sept. 10 turned over to the United States Car Company, a corporation which has been formed under the laws of New Jersey. Work at these shops has been suspended since the failure of the United States Rolling Stock Company over a year ago, but will now be resumed.

The C., B. & Q. is building another one of its new class M. engines for passenger service, also two compound class H. engines. The new paint shop at Aurora is nearly finished. It will house 22 cars. The old one, burned during the engineer's strike in 1888, held but 14cars.

Strength of Pine Timber.

At a meeting of the Southern Lumber Manufacturers' Association, held at Kansas City recently. Prof. J. B. Johnson, of the Washington University, St. Louis, read the following paper on the relative strength of pine timber:

The following table shows the relative strength of Northern white pine and of long leaf, short leaf and loblally Southern yellow pine, as determined by the United States timber tests to date, made at the Washington University Testing Laboratory, St. Louis, under the authority of Mr. B. E. Fernow, Chief of Forestry Division of the Agricultural Department, Washington. About half these tests were made on green timber, and half on the same timber after drying. They include some tests on large beams, but most of the tests have been made on sticks four inches square. Only the grand averages are given, and will show the strength of these four species of pine. The results are given in pounds per square inch. The column headed, "Elastic Resilience," indicates the toughness or springiness of the timber. It is given in inch pounds of work done per cubic inch of the timber, in cross breaking to strain the stick up to its elastic limit, or to the point where it begins to be permanently bent.

RELATIVE STRENGTH OF PINE TIMBER. STRENGTH OF LONG LEAF YELLOW PINE TAKEN AS 100 PER CENT.

Species.	No. tests each kind.	Cross-Breaking. Strength in lbs. per sq. in.		Elastic Resilience in inch-lbs. per cu. in.		Crushing End-wise Strength in lbs. per sq. in.		Crushing Cross-grain. Strength in lbs. per sq. in.		Tension. Strength in lbs. per sq. in		Shearing Strength in lbs. per sq.in.	
Long Leaf Y. P..	350	10.260	100%	2.27	100%	7,010	100%	897	100%	14,010	100%	687	100%
Short Leaf Y. P..	55	7.670	75%	1.74	77%	4,560	65%	726	81%	10,800	77%	534	78%
Loblally Y. P.....	105	6,830	86%	1.98	87%	5,180	74%	734	82%	12.800	91%	660	96%
White Pine.....	55	5,800	57%	1.04	46%	3,440	49%	465	52%	3,180	58%	404	59%

The relative strength of these four kinds of pine in the several ways indicated by the column of percentages where the strength of each kind is computed as a percentage of the strength of long leaf yellow pine, this being taken as 100 per cent. in each case. The compressive strength endwise is for short blocks, and must not be used for long columns.

The tests on long leaf yellow pine are fairly complete. Many more test trees are yet to be taken from other localities of the short leaf and white pine species. The tests were stopped from December, '91, to July, '92, from a failure of the small appropriation made for this purpose. They are now in progress again, but cannot continue through the fiscal year unless more funds are provided by Congress during the coming session. A bill was introduced during the last session appropriating $40,000 to this work. It finally passed as an amendment to the regular department bill, but was reduced to just one-tenth the original sum, or $4,000. The department will add several thousand dollars more from the current funds of the forestry division, and will try and obtain a larger support for this work from the next session of Congress. Tests have been commenced on the Southern oaks, but have not proceeded far enough to report on.

Car Heating by Steam.*

BY A. M. WAITT.

The near approach of the cold months of the year brings the subject of car heating prominently before those interested in the mechanical and operating departments of our various railways. With all the experiments and advances made in the past in this direction, I think no one will venture the assertion that a perfectly satisfactory result has yet been obtained. Since the extensive adoption of steam from the locomotive as a source of heat for cars, we have in most parts of the country, until last winter, had an absence of long continued spells of very cold weather, and as a result less progress has been made in the art of car heating than might have been expected. The last winter developed some results which no doubt have brought about decided change of opinion on a number of roads. I think it can be taken for a settled fact that for some years to come, steam is destined to be the working medium for heating our cars. The constantly increasing number of laws enacted in the different states, together with a due regard for economy, are sure to compel its general use.

In dealing with steam heat in cars, we are met at the outset with two distinct theories and systems by which the end desired may be accomplished, namely: First, the "Direct" system, which admits live steam directly into the radiating pipes in the cars; and, second, the "Indirect" system, which circulates heated water in the radiating pipes, the water being heated by immediate contact with live steam. Both of these systems have many advocates. As is the case oftentimes in politics, offensive partisans see everything good in the arguments on their side, and see no good on the other side,—so in the discussion of steam heating in the past the advocates of one system have held that they had no use for the other. After a careful consideration of the merits and demerits of both systems, I believe that in the present embryo stage of steam heating in cars each system has its own proper sphere, and in that sphere can fill the requirements better than any other.

In our passenger equipment we have two distinct classes of cars to heat, coaches and sleepers. The coaches are built mostly with only one compartment, and are constantly subject to opening of the doors in cold weather. The coaches, too, usually, have only single windows, which are some time loosely fitted and without weather strips to keep out the cold air. With the present general lack of auxiliary steam plants at many points of our lines, where passenger coaches are stored, there is the necessity of quickly warming up a car which is put in a train. As coaches, unlike sleepers, have no special attendant in charge of each car. there is need of great simplicity and freedom from use of apparatus which will cause trouble by neglect. All of these points seem to me to be best cared for by the use of the direct system of steam heating in coaches.

On the other hand the sleepers and compartment cars are used by through passengers mostly, and have the cold air from outside kept from entering the main part of the car by partitions and swinging doors. There is also less passing through them, and less getting on and off of passengers. At night these cars are divided by the making up of berths into numerous closed-in sections, rendering the conditions and requirements very different from that in the ordinary day coach, in which the air is subject to sudden and rapid changes of temperature, and where there is a free circulation of air through them, while in the sleeper there is no circulation of air to equalize the heat. In the sleepers, also, there is but little occasion for sudden heating up, as a porter is constantly on the watch in each car. With these conditions I am of the opinion that the indirect system of steam heating is better adapted to give satisfactory results.

On the road with which the writer is connected, we have had in use in coaches both systems of heating, and with the indirect have tried four different kinds. We have had weekly, and sometimes daily, complaints of freezing traps, lack of circulation, cold cars, burst pipes, etc., while from the direct system, generally only one complaint has been heard, that of occasionally too much heat in mild weather. The result of the above experience, after three or four years' repetition, has been to cause the adoption by the Lake Shore & Michigan Southern Railroad of the direct system for all coaches, baggage and mail cars. On sleepers the experiment has been tried with both systems of heating, resulting in the almost immediate abandonment of the direct system, for when the berths were made up for the night, and circulation of air was arrested behind the curtains, the heat become too oppressive for sleeping; and the porters were too apt to neglect the regulation of the heat, if indeed it were possible to properly regulate it. This result, of course, left the indirect system alone in the field for this class of cars. As there were many indirect systems proposed and used, it became a study to see which was the best, and to remedy as far as possible all existing defects.

It must be said of the writer's experience with indirect steam in sleepers on the rear end of from 12 to 14 car trains that in zero weather the complaints of cold cars, with temperature not above 60, were very numerous, and this with a pressure from the locomotive of 80 pounds. It has also been found in such cars in zero weather that with cars cool when leaving a division terminal, and from two to 10 pounds of steam on the gauge, it would take from one to three hours before a temperature of 70 was reached, and in many cases but little rise in temperature was obtained even in that time.

Having mentioned some of the difficulties and some of the strong and weak points in both systems, it may be well to analyze them somewhat, and see, if possible, what is needed to make them more perfect. Each system is composed of the following principal features: Train pipe, couplers, three-way valve, or its equivalent, radiating pipes, steam admission valves, traps, or their equivalent.

Train Pipes.—There seems to be on this point but very little difference of opinion, the general practice being 1½ inch pipe, well covered with abestos lagging. There is in the opinion of some an advantage in having the train pipe carried overhead, along the roof of the cars, instead of under the car body, as is the general practice. Of this I can say that I have never been able to see any gain by overhead piping, except the freedom from water of condensation. To offset this there is greater liability of leaky couplings, and constant peril to passengers and trainmen from dropping water, also inconvenience in making couplings at a point out of reach.

Couplers.—Experience has demonstrated that in the matter of couplers a coupler having flexible wire bound rubber connection is much cheaper and freer from breakage than any so-called flexible metallic connection that the writer has yet seen in practical use. A well-made, rubber hose, five-ply, wire bound, will stand at least one season's service without failure, and such hose are now made and guaranteed for such a time. It can also be said truthfully that there are in the market steam couplers, free from leaking, simple in manipulation and highly satisfactory, that have now successfully stood the test for years. On the Lake Shore we are using the Sewall, which fulfills the above description and is doing good service.

Three-Way Valves.—The controlling of steam in the train pipe of the individual car is done in three different ways that have come to my notice. 1. By a single three-way valve, located generally near the center of the bar. 2. By two single valves, located near the center of car, one in train pipe on each side of opening of the branch-pipe. 3. By cocks located in train pipe at each end of car, under platform.

To the mind of the writer, the single three-way valve is by far the best plan, as by its use with one turn all the results obtained by either of the other two valve methods can be obtained. It is simpler to understand and manipulate, less work to apply, and less liable to allow a place for condensation to collect and freeze. The system with cocks under the platform is very objectionable from the fact that in case of accident, or if it is desired to blow out the train pipe, the cocks can only be opened or closed by stopping the train and getting under car.

The best three-way valve should be so arranged that the water from the drip will pass through or be in contact with it, so that when there is any steam in the train pipe the drip outlet can never freeze. The adoption of a uniform style of floor plate, and marking for the same, is very desirable, especially in the case of sleepers or other cars which are interchanged by different roads.

Radiating Pipes.—When the use of direct steam for car heating was first adopted there was a fear of insufficient heating, and a mistake was made by the use of altogether too much radiating pipe. One of the first plans, consisted of two lengths of two-inch pipe on each side of the cars, and in addition a spur of two inch pipe from 12 to 30 inches long under each seat. This resulted in putting steam heating into bad repute by making cars perfect sweat boxes and making it very uncomfortable to sit on cushions with a hot steam pipe directly under the entire length of each one. Gradually the use of spurs and return bends have been curtailed, until now the most approved arrangement consists of two lines of two-inch pipe on each side of the car, without any spurs or radiators under the seat. In some cases it has been deemed best to use 1¼-inch pipe, and in addition a short 10-inch spur under alternate seats.

With the indirect system of heating, experience has shown that there has been a lack of the requisite radiating surface, and it is being gradually increased. The prevailing practice has been to use one and a quarter inch pipe, and the same amount of it as with the simple Baker heater. In the writer's opinion, much better results would be obtained in long cars by using not less than one and a half inch pipe, thereby allowing freer circulation and increasing considerably the radiating surface. The radiating pipes of each side of the car in the direct system should, for proper regulation of heat and adjustment, have a separate steam controlling valve, and a drip valve, also a separate pressure gage.

Steam Admission Valves.—In this feature of steam heating lies much of the secret of successful results in the direct system of car heating. Most cars at present are equipped with an ordinary cheap globe valve to control the admission of steam to the radiating pipes. With such valves in good order, if the valve is just started from its seats by a small fraction of a turn of the spindle, there is an opening made for the steam admission as large, if not larger, than the supply opening from the locomotive boiler. This admission of steam is enough to keep the car well heated in freezing weather, after it has once been once warmed up. If the weather is mild, and only enough heat wanted to take away the chill to the air, it is impossible to graduate the valve sufficiently fine, but an approximate result must be obtained by alternate turning on and shutting off the steam, which, of course, results in great dissatisfaction.

Another difficulty with the common globe valve for an admission valve arises from the fact that it can be kept in order but a short time. After a few months' use they become so warped that few of them can be closed absolutely tight, and many times it becomes impossible to cool the cars off, except by shutting steam out of the car at the three-way valve. To overcome these difficulties and to put it within the power of a reasonably intelligent trainman to regulate the amount of admission of steam to the amount passing through an aperature 1-100th of an inch in diameter if desired, a committee was some months ago appointed by the heads of the mechanical departments of some of the Vanderbilt lines, to prepare specifications for a suitable valve. The result has been that two reputable companies are now prepared to furnish, at a reasonable figure, a valve having all parts subject to wear renewable at small cost, leaving the shell of the valve intact; the valve is capable of an adjustment such that one full revolution of the spindle will give an area of opening of only about 1-100th of an inch, the valve being capable of opening to full area of a one inch pipe. The valves are so constructed as to be especially free from cutting out by wire drawing of steam. With a durable valve of this kind it becomes possible for a trainman to be able to readily regulate the admission of steam to so small an amount that it will not even heat the entire length of pipe in the car, and with a properly instructed trainman, good results can be obtained.

Traps.—If the inspectors and trainmen on our roads are carefully questioned it will be found that traps are a source of constant trouble, sometimes from freezing up or choking with water, and sometimes from allowing too much steam to waste. Of all the traps examined by the writer, after they have been in practical operation for any great length of time, none have been found but what need constant readjustment to suit any material changes of outside temperature. It often happens that on starting on a long run, a trap may be all right for the present temperature, but after a 400 or 500-mile run the thermometer stands 20 or 30 degrees lower; under these circumstances many traps become choked with water and frozen, causing delays in thawing out and readjusting.

In view of these facts, many companies have abandoned the use of traps and have substituted a much more satisfactory method of caring for the condensation, namely, the use of a globe valve at the end of the radiating pipes on each side of the cars. In some cases it has been deemed wise to file a small groove in the valve seat, so it can never be entirely closed. Such a groove is intended to be large enough to take care of all condensation in mild weather, and in cold weather the trainmen are expected to adjust the opening of the drip valve to suit the amount of condensation. By others it has been thought best to leave the drip valve intact, and allow trainmen to regulate it for all conditions. This arrangement permits of allowing the condensation in mild weather to partially fill the radiating pipes, and the heat to be then controlled by the amount of condensation allowed to pass off. It can be readily seen by this arrangement that if half the pipes were filled with water the steam would only reach and heat the other half of the pipes.

With the present state of invention in relation to traps, I think the plain drip valves have decided advantages. In this connection I would recommend that, where possible, the steam admission and drip pipes should be kept in contact and covered in the same jacket, and the outlet of the drip be in contact with the three-way valve, or pass through it as is arranged for in one style of three-way valve now on the market.

Read at the September meeting of the Western Railway Club.

The Southern Pacific Railway has recently subscribed for $20,000 of World's Fair stock. The various transportation lines of the country have taken an aggregate of about $1,000,000 of the stock.

Recent advices state that work will be begun almost immediately on the San Francisco & Atlantic road. It will start from Oakland, being connected by ferry with San Francisco, and will run to Stockton, and thence south down the San Joaquin valley, east of the main line of the Southern Pacific. It will cross the Atlantic & Pacific line of the Atchison at Kramer and thence run direct to Los Angeles.

The Frankfort Shops of the West Shore Railroad.

The mechanical department of the West Shore road is presided over by Mr. James M. Boon, who has for many years been prominent in American railroad mechanical circles. Mr. Boon was a pioneer in the standarizing of the various parts of locomotives, by which practice he brought order out of chaos on the old Fort Wayne road many years ago, and established a famous reputation among American locomotive men.

Because of the uncompleted condition in which the financial embarrassments of the West Shore road found the shops at Frankfort, the management of the mechanical department of this road has been a very arduous task, which required the best kind of generalship to properly maintain the rolling stock with the overcrowded shops and limited facilities available.

Evidences of an incomplete plant appear wherever one goes about these shops. The office building presents a good appearance from the outside, but within all is in a rough unfinished state. Some of the shops and out buildings do not appear to be located in the most conveniently relative places, but this is because the original plan of the plant is as yet uncompleted. In the erection of all buildings the aim has been to adhere closely to the original plan, and when all are finally built they will no doubt constitute one of the best and most convenient plants in the country for the maintainance of railroad rolling stock.

The company has wisely provided, in the office building, wash and bath rooms for the employés, together with a reading room, library, and a good-sized auditorium where lectures or entertainments can be given.

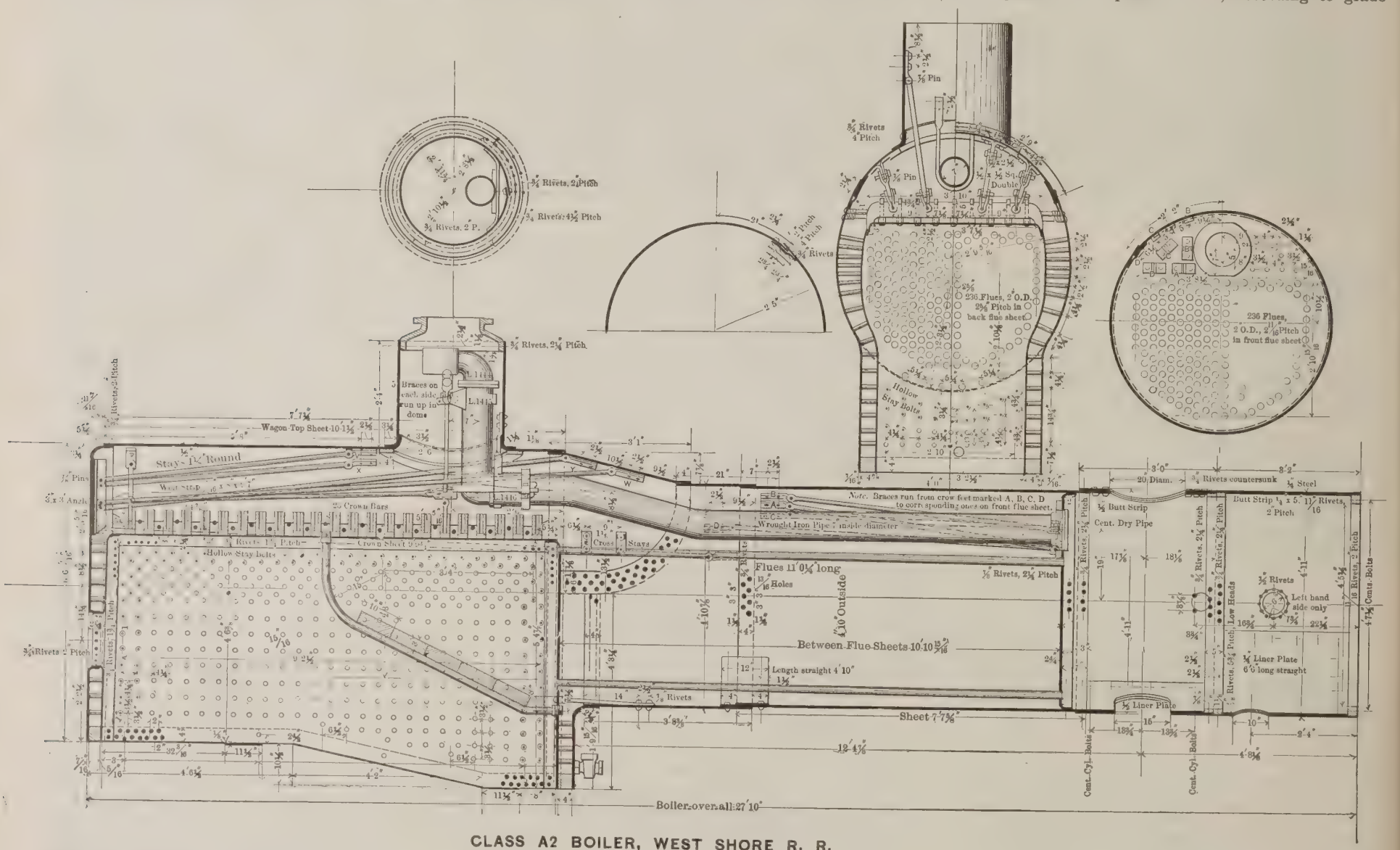
A noticeable feature of the car erecting shop is a pit eighteen inches deep for each track, extending the full length of the shop. It would seem that such pits could be adopted with good advantage in other car erecting or repairing shops. Pits are absolutely necessary to conveniently work underneath locomotives, and at these shops they have proved a great convenience to the workmen, and have facilitated the work of erecting and repairing cars very much.

Frankfort being a small town and without very efficient facilities for coping with fire, special facilities for use in case of fire are arranged and kept in constant readiness at the shops. These consist of a small but complete and efficient fire engine and hose cart, and a frequently drilled corps of attendants. The engine was designed by Mr. Boon and built at these shops especially for that purpose. It is kept neatly housed quite close to the cluster of shops, and is always kept in readiness for work, the water in the boiler being kept heated by steam, and kindling and fuel on the grate ready for instant ignition. A working pressure of steam can be raised in four minutes.

Mr. Boon has very advanced ideas of fuel economy in locomotive operating. All his engines are equipped with close notched quadrants, and he requires his engineers to run with the shortest practicable cut-offs. He is well satisfied that this is a most effective way of doing good work with the least coal consumption. Working in the same line he is now equipping his engines with larger boilers capable of retaining higher pressure of steam. We illustrate herewith the new (Class A2) boiler that is being applied to the 18 inch by 24 inch engines on this road, in place of the old Class A boiler, and in the following table compare the principal dimensions of the old and the new boilers :

Class A2 Boiler.		Class A Boiler.
10 ft. ¼ in.	Length of firebox	10 ft. ⅜ in.
5 ft. 4⅞ in.	Depth " " (front)	4 ft. 1¾ in.
4 ft. 6⅜ in.	" " " (back)	3 ft. 9½ in.
4 ft. 10 in.	Dia. of waist	4 ft. 7 in.
236	No. of flues	188
2 ft.	Dia. " " (outside)	2 ft.
11 ft. ¼ in	Length of flues	11 ft. ¼ in.
5 ft. 1 in.	Dia. of boiler (back end)	4 ft. 5⅞ in.
From bottom firebox to top of outside sheet (back end)		5 ft. 8⅛ in.
6 ft. 6 5/16 in.		
1,349 sq. ft.	Heating surface, flues	1,052 sq. ft.
155 sq. ft.	" " firebox	137 sq. ft.
1,504 sq. ft.	" " total	1,189 sq. ft.
4.17 sq. ft.	Area through flues	4.17 sq. ft.
32 sq. ft.	Grate area	34 sq. ft.
150 lbs.	Pressure per square inch	140 lbs.

These boilers not only effect a considerable saving in fuel but they enable the engines to haul heavier trains and make faster runs. It will be noticed that the grate area of the new boiler is two square feet less than that of the old boiler. This reduction was effected by decreasing the width of the firebox and increasing the water space between the inside and outside shells from three to four inches. These boilers are free steamers and are giving entire satisfaction. The old boiler was for burning anthracite coal, the new for bituminous.



CLASS A2 BOILER, WEST SHORE R. R.

A VALUABLE BOOK.

"A Book which every man interested in the Construction or Maintenance of Cars ought to have convenient for reference."

(From Locomotive Engineering.)

This is a practical work, written by a master car builder, thoroughly familiar with every detail of car designing and construction, and having the language and expression necessary to tell what he knows. It is the only book we know about on car construction. It is likely to become a manual for those requiring information on the subject. Few manuals have been written that required so little correction or modification. Mr. Voss takes up the construction of freight and passenger cars in detail and illustrates the work as it progresses by profuse use of drawings, every step being made clear. Among the leading subjects treated are freight car bodies; floors and framing; sheathing and roofs; freight car trucks; power brakes; passenger cars; passenger car superstruction; passenger car trucks, etc. It is a book which every man interested in the construction or maintenance of cars ought to have convenient for reference.

The Rogers Locomotive Works is building one simple and one compound six-wheel coupled suburban engine for the Illinois Central. The compound engine will be built so that it can be converted into a non-compound if desired.

Firebox Steel.

Steel is not yet a perfected product, and its finality is a question of experiment and time. Science, both in chemical and mechanical directions, is progressive, and may be said to be yet in its pupilage. The chemist in metallurgy is now one of its vital constituents, and as the range of intelligence and experiment broadens, will be increasingly so. From the man who used iron for the reason that it could pound a flint and perforate a board or a breastbone to the highly finished skill that formulates a plate that smiles at a cannon and refuses admission to a projectile, there is the distance of centuries of time and as many cycles of intelligence.

Of late years progress on scientific lines has been accelerated by the pressure of industrial development. Old-time skill was necessarily limited in the sphere of product. It made exquisite blades for the military carving of human meat, and in ages when metal was canonized in shrines and temples its sacerdotal service was the limit of its industrial scope.

Modern demand, while by no means exclusive either of weapons or images, has outclassed them both in general industrial service. In rails and ship plates, boilers and fireboxes, and a hundred other forms of practical utility, the modern metallurgist finds his special and most remunerative occupation. In this transfer of industry steel has come to the front, and is likely to retain its premiership till its successor is evolved by advancing science. In the matter of steel plates their respective merits, according to grade and process, is a matter of debate. For special forms of service each may have its own legitimate claims to competency, and it is perhaps largely on the division lines of applicability that quality and competition accentuate themselves.

A discussion on boiler and firebox plates, by so competent and practical a body as that of a Master Mechanics Convention, has opened up a question of merit between the old and the new steel plate. Facts were adduced in comparisons not exclusively favorable to the newer product. . . .

It is probable that in the economic as much as in the metallurgical factor the key of the situation is to be found. Cheapness in no manufactured article is the guarantee of its excellence. It is not in every case a criterion, but in a general sense it is neither security nor bondsman. Where cheapness is unreasonably insisted on, quality as a rule suffers from paint out of the same pot. The manufacturer, as the purchaser, has to draw on his profits for his dinner, and in this matter, in steel as in leather, the quality settles the value. As between the respective merits of crucible or open hearth steel, the evidence awaits completion; but the law remains inexorable that the man who pays a water price for milk is very apt to mistake the pump for the cow.—*The Age of Steel.*

The Peoria & Pekin Union road has ordered three locomotives of the Brooks Locomotive Works.

A Preliminary Test of the Purdue Locomotive.

Some months ago there was given in the NATIONAL CAR AND LOCOMOTIVE BUILDER a brief description of the Purdue University experimental locomotive "Schenectady," which, it may be remembered, is so mounted in the laboratory that it may be fired and run as though it were upon the track. The drivers rest upon supporting wheels which in turn are carried by shafts running in fixed bearings. These supporting wheels turn by rolling contact with the drivers whenever the latter are in motion. Load is supplied by friction brakes on the shafts of the supporting wheels, and is measured by a suitable dynamometer attached to the drawbar. The original plan involves four friction brakes, but thus far only two have been got in place. It is now several weeks since the engine was first under steam, but the demands upon the time of the laboratory corps have been of such a nature that nothing more than preliminary tests have been attempted. In the mean time, minor difficulties have been met and overcome, and the attendants have acquired some skill in the management of the somewhat novel and complicated mounting machinery. The power developed in these early tests is too light to make the results of high value for the purpose of comparison with those obtained from locomotives on the road, but there is much in them, and in the process by which they were obtained, that is of interest.

It is, in fact, not probable that a locomotive was ever before run for six consecutive hours under conditions so nearly constant, as those under which the Purdue locomotive "Schenectady" was run on the 10th of last May.

The test was conducted by Mr. W. C. Wickersham, a post-graduate student at Purdue, by whom also all calculated results were obtained. He was assisted in getting the data by observers selected for the purpose from the Junior Class in mechanical engineering. Incidentally it was the purpose of the test to prove the value of certain provisions that had been made for supplying oil to the several bearings during a run.

Previous to starting the test, the locomotive was run long enough to warm it thoroughly. The fire was kept light and even. When all was ready the engine was stopped, the ash pan cleaned, and the condition of the fire carefully noted. In starting, the engine was got under the condition of the test as quickly as possible. In less than a minute after the start the gong was rung, all observations were taken, and the test was assumed to have commenced. Observations were repeated every twenty minutes. Steam was kept as nearly as possible at 130 pounds, and it did not often vary five pounds either side of this pressure. No steam was lost by the safety valves, which were set at 140. It was expected that the throttle would not be moved during the test, but soon after the close of the fifth hour, some oil dripped unobserved on the rear supporting wheels and slipping occurred. The engine was stopped for fifteen seconds, and it was three minutes before all the conditions of the test could be restored. With this very slight interruption, the engine was worked steadily under a constant load for the entire six-hour run, the speed meanwhile fluctuating slightly as the steam pressure varied. The "Schenectady" is an eight-wheeled locomotive, and its principal dimensions are as follows:

Cylinders, inches	17 × 24
Drivers, inches	63
Pounds on drivers	5,600
Whole weight, pounds	85,000
Grate area	17.2
Diameter of boiler, inches	54
Diameter of tubes, inches	2
Length of tubes, feet	11.5
Number of tubes	200
Heating surface of firebox	121
Heating surface in tubes	1,046
Total heating surface	1,167
Diameter of exhaust nozzles, inches	3

The following is abstracted from the log of the test:

Date of test	May 10, 1892
Duration of test	6 hours
Total revolutions	39,117
Revolutions per minute	108.6
Total miles	121.9
Miles per hour	20.3
Traction as represented by stress in drawbar, pounds	2,500
Power equivalent of stress in drawbar	135.3
Indicated power	176.6
Friction of engine, horse-power	41.3
Friction of engine, per cent. of indicated power	23.4
Cut-off, per cent. of stroke	22.6
Pounds of wet coal fired	5,200
Per cent. of wet coal accounted for as water	4.61
Pounds of dry coal fired	4,959
Pounds of cinders caught in smoke box	116
Pounds of ash and non-combustible	225
Pounds of combustible burned	4,618
Pounds of dry coal per square foot of grate per hour	47.4
Draft in inches of water	1.08
Average boiler pressure by gage	129.2
Average pressure in dry pipe by gage	118.9
Temperature of feed water (Fah.)	56.9
Number of times injector was started	28
Number of minutes injector was running	214
Pounds of feed water delivered to injector	32,399
Loss from injector overflow	150
Pounds of water delivered to boiler	32,249
Pounds evaporated per pound of dry coal	6.53
Pounds evaporated per pound of combustible	7.03
Pounds evaporated from and at 212 degrees per pound of coal	7.87

On the night of Sept. 8 a train on the Atchison, Topeka & Santa Fe was attacked by robbers at Wharton, a water station in the Cherokee Strip, and the express car broken open, but after trying for some time to break the safes, the robbers gave up and went away. The passengers were intimidated by pistol shots; these were returned by the trainmen, but the robbers got away.

A Neat Trip Report Card.

The form presented herewith is a reproduction, accurate in size and composition, of both sides of the engineer's trip report card used on the Southern Pacific Co.'s lines.

It is about the neatest arrangement of a very important form that we have met with, and the sum of money that is saved annually by its use, in weight of paper alone, on a railroad where many hundred are used every day is certainly considerable, and should suggest a possible economy to railroads that now use unnecessarily large forms for this purpose.

ENGINEER'S TIME CARD.

Engine No.....Initial.....
Date.....189
From.....
To.....
Train No.....
Card Mileage.....
Way-Switching-Miles.....
Tubs Coal at.....
" .....
Cords Wood".....
" ".....
" ".....
Time Claimed.....
Engineer.....
Fireman.....

OVERTIME CLAIMED: Fill in only when claimed.

Engine ordered for..... .... M.
Left..... .... M.
Arrived .... M.
Schedule time..... .. ....Hrs.....M.....
On Road .. .. Hrs.....M.....
Overtime claimed..... ....Hrs.....

Report delay at each station when overtime is claimed.

WHAT STATION.	HOURS	MIN.	CAUSE OF DELAY.

Color Blindness.

The report of the English Royal Society Committee on Color Vision establishes, if, indeed, there were any doubt of the fact, that nearly four per cent. of the males in the civilized countries are deficient in acuteness of color perception, and that these persons may usually be described as being "blind," completely or incompletely, to one of the primary colors of the spectrum. Blindness to red is the most common condition; blindness to green comes next in frequency, and blindness to blue is rare. A few persons have been found who are blind to two of the three colors instead of to one only, and there have been instances of blindness to all. For the purposes of railway and marine signaling, the important conditions are blindness to red and to green, both of which entail a liability to confound these colors with one another.

Hence the only safety of ships and of trains is to be sought in the institution of such an examination, on the threshold of railway or marine service, as may suffice to exclude candidates who are unfit to enter either. The number of persons to be excluded does not amount to quite four per cent. of the male population, and as many other forms of employment are as much open to them as to the color-sighted, their exclusion from two industries cannot be looked upon as a hardship.

The report, therefore, recommends that certain employment should be scheduled by the Board of Trade or by other public authority, and that no one should be permitted to engage in these employments until he had obtained a certificate of normal color-vision from an appointed examiner.

Defective color vision may be of two kinds: the first, which is congenital, a matter of formation and absolutely unalterable, so that one examination with regard to it, if properly conducted, is sufficient for the whole of life; and a second, which may be the result of disease, and which is most frequently occasioned by the excessive use of tobacco. In this form, which may be recovered from, ordinary vision is always also affected, and hence the tests for ordinary vision would suffice for the detection of the acquired variety of color blindness.

The Old Colony road has just added to its equipment six new Pullman coaches, which will be used on its Boston and Washington express train.

Grammar in Sign Painting.

Mr. Charles E. Copp, in *Painting and Decorating*, describes some experience in lettering signs for use on the Boston & Maine road: "A personal experience that the writer had was in lettering some small signs—a dozen or so—to be hung across the steps of cars in Boston which were not intended to accompany the rest of the train.

"The boards were delivered to the writer with a slip of paper bearing the legend, '*This car don't go*,' this phrase being intended to go on the boards. With an alacrity born of obedience and without a thought of the grammar of the thing the signs were executed and were duly hung on the cars. Then the passengers who were probably well represented by teachers and school girls, I suppose, began to smile and crack jokes about the signs as they passed them in the station on their way into 'the Athens of America.'

"In the course of time—and that not long—the signs came back to be planed off and lettered over again, with the remark by our late lamented General Manager to the Master Car Builder, 'That's the way we *talk*, but it won't do in print.' Of course the average reader will see that the trouble was with the verb 'don't,' which is a contraction of *do not*, and hence did not agree with the noun 'car' in the singular number. This little affair taught the writer a lesson which he has not forgotten; and afterward, when orders for signs or lettering were handed him, they were scanned to see if they were correct as far as his little knowledge went.

"Another case: The writer once held an animated discussion with a former chief clerk in the car department, who doubted the correctness of placing a period after an initial letter before a character &, as for example, in the initials of this road: B & M. R. R. He never gave in to our position, though we quoted the rule of language to him that 'a period must follow every initial letter' without exception to be correct. I mention this because of the publicity this same error once gained on the interior of the passenger cars of a certain road. The name of the road was the B. L. & N. R R., which an erstwhile foreman painter insisted in putting this way: 'B. L. & N. R. R. at each end of the deck on all of the cars, much to our amusement. But happily it is passed out of sight now."

Briggs—"Did you know that Robinson died suddenly coming over on the train from Boston the other day."

Griggs—"Great heavens, no! What was the cause of it?"

Briggs—"He succeeded in opening the car window, and the shock killed him."—*Detroit Free Press.*

Official returns show that for the 12 months ending June 30 last Canada imported cars from the United States to the value of $80,058 against $203,544 during the same period of 1891.

The completion of 24 cars at the Edison car shops recently affords much satisfaction to Washington lumbermen. The woodwork is entirely of fir, not an inch of Eastern lumber entering into its composition. The cars are the first of an order of 200, and were built as an experiment. The strength of fir and its lasting qualities will not be better demonstrated than in these cars, because the test will be severe. The cars ought to be advertised all over the country, because it opens up a new field for fir. There are several roads in the white pine country that are adopting fir for car building purposes, and the day is not far distant when much of the bridge timbers and car material in use throughout the United States will come from Puget Sound. —*Puget Sound Lumberman.*

At the International Railway Congress recently held in St. Petersburg, a statistical table showing the lines open in the different quarters of the world was presented, and this table shows that their total length at the beginning of this year was 385,803 miles, of which 167,755 are in the United States, 14,082 miles in Canada, and 5,625 miles in Mexico and the Argentine Republic. In Europe, the German Empire comes first with 26,790 miles, France second with 24,310 miles, Great Britain and Ireland third with 22,685 miles, and Russia fourth with 19,345 miles. Wurtemburg and Denmark are the countries which have made the least progress in the construction of railways since 1886; while in Asia, apart from the 16,875 miles of lines in India, the Transcaspian line recently constructed by the Russians is 895 miles in length, the Dutch colonies have 850 miles of railway, the French 65, and the Portuguese 34, while there are 125 miles of lines in China and 18 in Persia. In Africa, the colonies of Algeria and Tunis come first with 1,940 miles, the Cape Colony second with about 1,880 miles, Egypt third with 965 miles, and Natal fourth with 341 miles; while the Orange Free State has 150 miles, and other minor States about 300 miles. In Australia, the figures are 2,703 miles for Victoria, 2,275 miles for New South Wales, 1,645 miles for Queensland, 1875 miles for South Australia, 515 miles for West Australia, 401 for Tasmania, and 1,950 for New Zealand.

The Illinois Central R. R.'s World's Fair Cars.

In the May NATIONAL CAR AND LOCOMOTIVE BUILDER, a short description was given of a type of car the Illinois Central Railway had decided to build to accommedate its World's Fair travel at Chicago. Several hundred of these cars have now been ordered of different car building works, and we present herewith engravings showing the general arrangement drawings, and a reproduction of a photograph of a car complete.

These cars have the same floor framing as the Standard Illinois Central fruit car. The length over all is 35 feet, and the width over all is 8 feet 6 inches; height bottom of sills to top of plates, 7 feet 5 inches.

car and the arrangement of seats and entrances, which are similar to those of summer street cars. No doors are provided for the entrances, but these can be closed by canvas curtains if desired.

It will be noticed that no car steps are provided. They are unnecessary, because it is intended to run these cars only in trains that will make no stops between the fair grounds and the main depot, and at these places platforms on a level with the car floor will be provided. This is the best possible arrangement, and will not only operate to the great convenience of passengers, but will insure the loading and unloading of the cars with the greatest celerity. Automatic gates consisting of a horizontal and diagonal bar protect each entrance. These bars are

ILLINOIS CENTRAL WORLD'S FAIR CAR.

All the longitudinal sills are of Southern pine, five inches by nine inches, and the end sills are of white oak, seven inches by nine inches. The roof will be the standard box car roof covered with tin, and having the usual running board on top. With the exception of the roof, the car does not follow any existing standard of the road above the floor frame, and nearly all the upper framing will have to be removed when the cars are withdrawn from passenger service.

The cars are provided with 14 windows having two sashes, the upper being 12 by 20 inches plain ground glass, and the lower 29 by 24 inches clear American plate glass. The sashes are made of red cherry. The outside sheathing is of yellow pine, and is painted the Illinois Central standard coach color and varnished. The inside is painted a light cheerful color.

shown in the engravings, and they are arranged so as to be operated automatically or separately from the station platform or the roof of the car.

These cars are mounted on the standard fruit car trucks with rigid bolster and elliptic springs, but because of the relatively light weight of the passengers compared with the load the trucks are designed for, and to make the cars easy riding, double elliptic springs of half the capacity of the ordinary triple ones will be used.

The Pennsylvania Railroad will build about 100 cars for local World's Fair travel. They are to be built on the frames of standard 34 ft. gondolas, and when the occasion for their use is passed will be altered for freight service. They are to be used only on short runs and will be made as comfortable for passengers as possible.

The American Association of Railroad Clerks.

The third annual convention of the American Association of Railroad Clerks was held in Philadelphia, Sept. 22. Mutual benefit and employment departments were established. John B. Triebler, Jr., of Philadelphia, was elected Grand President, and it was resolved to hold the next convention in Grand Rapids. Strikes are not countenanced by the Association, as the members claim such a principle in their organization would antagonize many who were powerful friends. The following views of the Association on the labor question have been adopted:

"*Whereas*, The position of the American Association of Railroad Clerks in regard to the labor question seems, in the minds of many, not to have been clearly defined, it is hereby

"*Resolved*, That this Association does not in any way countenance strikes or any agitation to promote the interests of the Association or its members by force or coercion; nor will it affiliate or co-operate with any Association having that end in view."

OBJECTS OF THE ASSOCIATION.

For the benefit of many hundreds of railroad clerks to whom the objects of the National Association are not quite clear, the following page from the constitution is reproduced. They are:

To promote the welfare of railroad clerks in all practicable ways; among others:

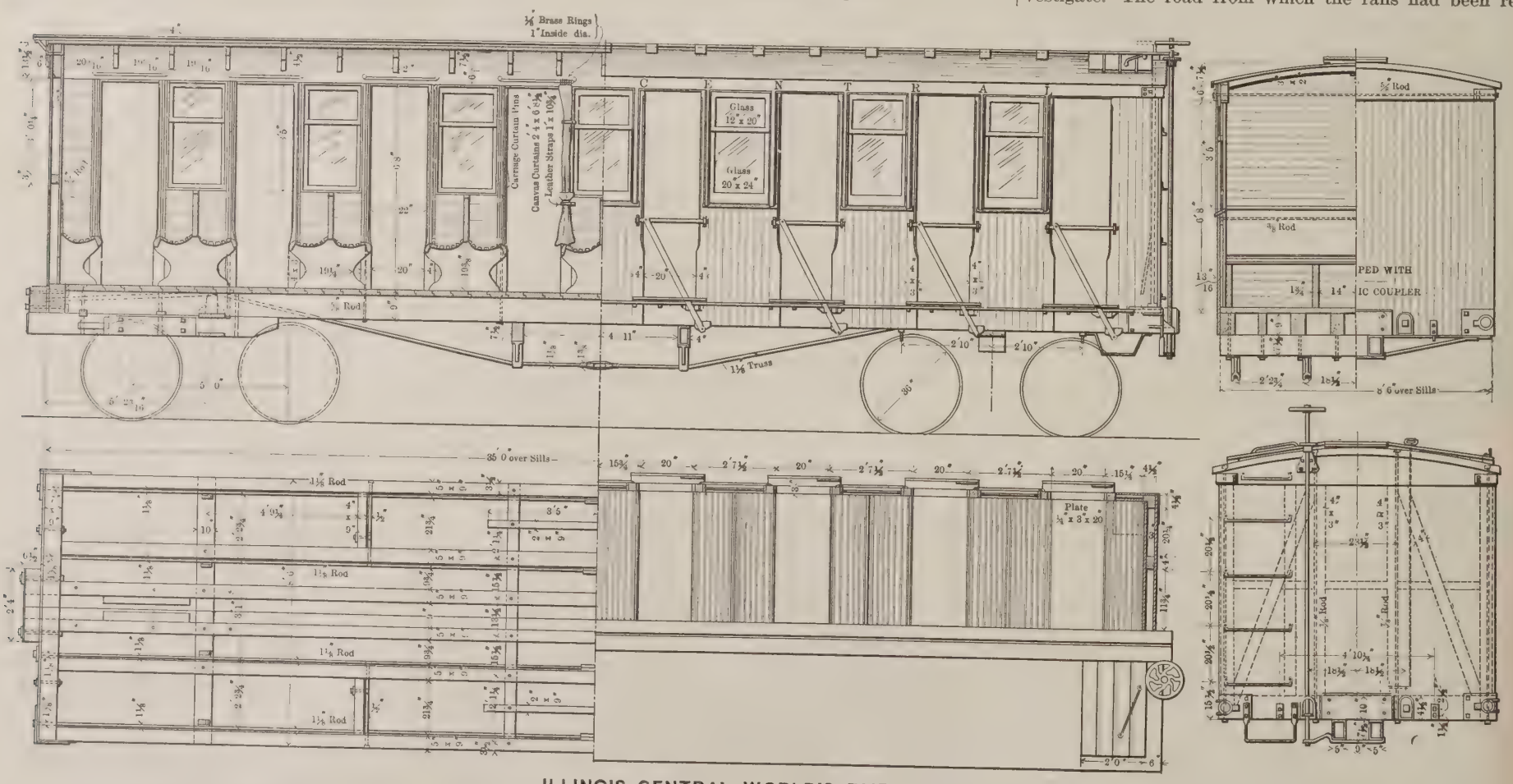
1. By assisting them to obtain positions.
2. By encouraging them to qualify themselves for promotion by thought and discussion on practical questions, fidelity to the interests of their employers and integrity in their business relations.
3. By endeavoring to win for them a higher degree of respect from all, and especially to merit the good will of the officials.
4. By extending their acquaintance beyond local limits; laying the foundation for a broader knowledge of railroad affairs; an interchange of ideas and methods; kindly fraternal relations, and enlarged personal influence.

Suggestions to Prolong the Life of Wheels.

The railroad experience of C. B. Adams, Car Service Agent of the Wabash, dates back to the time when Col. Rob't Andrews was Superintendent of the old Wabash Western. A portion of that company's line was then laid with old English iron rails and a small part with steel from the Carnegie mills. It became necessary, after a time, to remove some of the main line rails to another portion of the road, and it was observed that after relaying them many gave out immediately while others showed no evidence of wear.

To determine the reason for this apparently unaccountable condition, Col. Andrews detailed Mr. Adams to investigate. The road from which the rails had been removed was built in a northwest-southeast direction, and in relaying a large number of rails had been turned end for end. Those that had not been so turned showed no additional wear while the turned rails gave out in thirty to ninety days. The conclusion arrived at was that the metal had become polarized from long use, when first laid, and the fiber got broken up by the traffic in the opposite direction to which these fibers had been formed.

In the observations on rolling stock it was found that cast iron wheels gave about twice the mileage when the cars were turned at each end of a journey than when they were run forward and backward without turning.



ILLINOIS CENTRAL WORLD'S FAIR CAR.

Two Adams & Westlake lamps give illumination at night, one being placed in each end of the car at opposite corners. The draw gear is the standard of the Illinois Central, which is the American continuous. Draw bars are the M. C. B. standard. The cars are also to be provided with safety chains and hooks at both ends.

The Westinghouse airbrakes are used, the piping for same conforming to the Westinghouse latest standard for freight cars. The cars are also equipped with the latest Westinghouse pattern of conductor's valve for passenger car.

The illustrations show the general appearance of the

The Buffalo Car Manufacturing Company is just finishing the last of an order for 100 large furniture cars for the New York Central & Hudson River road, which completes the order for 1,000 cars recently given.

A circular has been issued by Vice-President Thomas, of the Chicago, Lake Erie & Western to the effect that the use of live fire for heating or other purposes, on cars hauled in passenger trains, within the State of New York, being prohibited by law, that company is compelled to decline to receive for transportation, in its passenger trains, any cars with fire in stoves.

New Designs of Throttle and Quadrant.

The following illustrations show some improvements in locomotive details recently adopted by the Schenectady Locomotive Works, and now being quite largely used on engines built by these works. Figs. 1, 2 and 3 are reproductions from photographs of a new throttle which is designed to overcome the difficulty of leakage due to the heavy pressure and unequal expansion of a large valve. This is really a double throttle, it having two double-puppet valves and the rigging for operating them. Fig. 1 shows both valves closed. Fig. 2 shows one valve partly open and the horizoutal cross lever, which is fulcrumed at one end, taking hold of the other valve. Fig. 3 shows both valves full open. The combined area of the two valves is, when full open, 60 per cent. greater than the capacity of the dry pipe, which overcomes to a large extent wire drawing of the steam throughout the several turns of pipes and passages and openings of valves.

These throttles are giving very good satisfaction, as the opening of but the one valve at first permits of nice manipulation of trains in starting, and the extra large opening afforded by both valves enables the engines to be operated with unusually short cut-offs, effecting considerable saving in fuel.

Following this matter out to its logical conclusion, the Schenectady works have very sensibly adopted an improved close notched quadrant, two styles of which we illustrate in the accompanying drawings. Fig. 4 shows the standard quadrant adopted for eight-wheel passenger engines, and Fig. 5 shows the quadrant as necessarily modified to apply to consolidated freight locomotives. It will be observed that both quadrants have very long radius, giving fine graduation.

The notches of the C., B. & Q. and Southern Pacific quadrants, illustrated in the June issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, are spaced from center to center, but $\frac{5}{8}$ inch and $\frac{7}{16}$ inch respectively apart, while the Schenectady quadrants are spaced $\frac{1}{4}$ inch between center and center of notches; but the longer radius of these quadrants compensates in a measure for the difference in the spacing of the notches and gives approximately fine graduation.

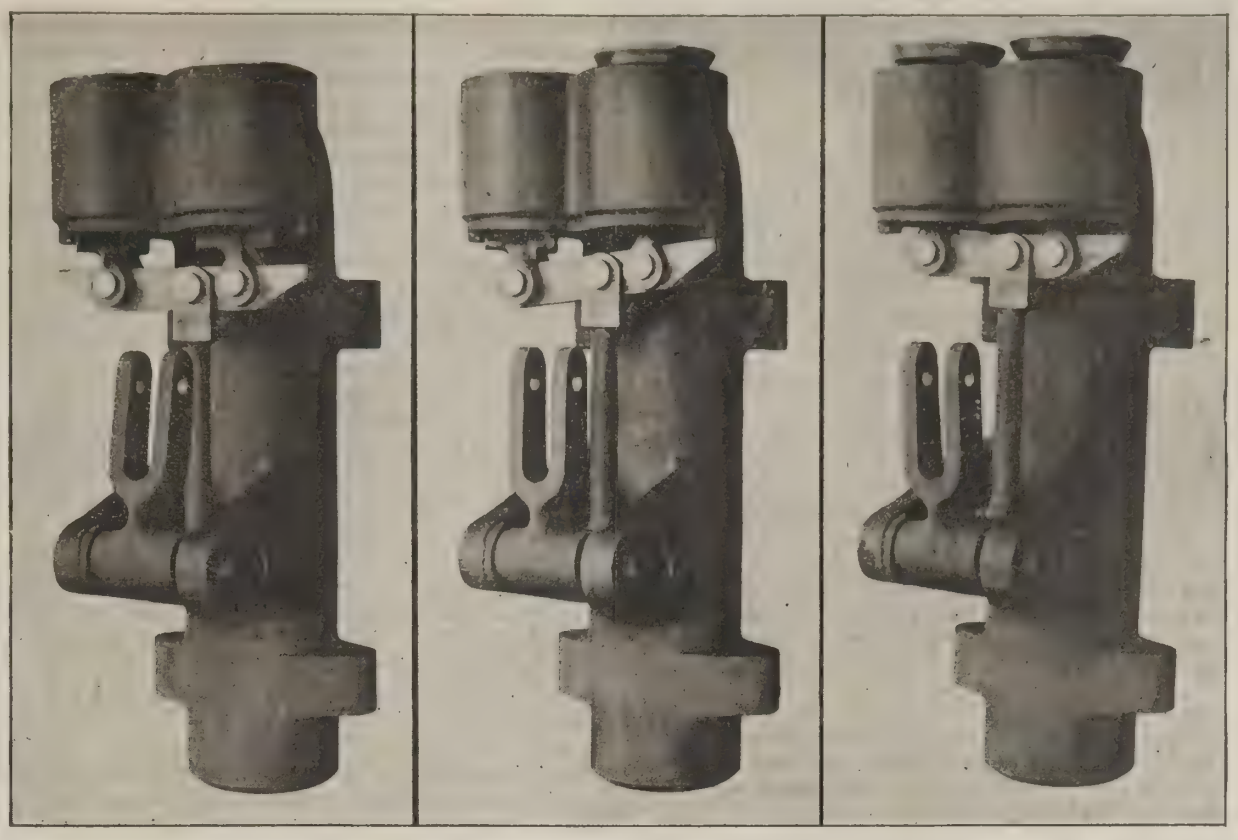


Fig. 1. Fig. 2. Fig. 3.

NEW DESIGN OF THROTTLE, SCHENECTADY LOCOMOTIVE WORKS.

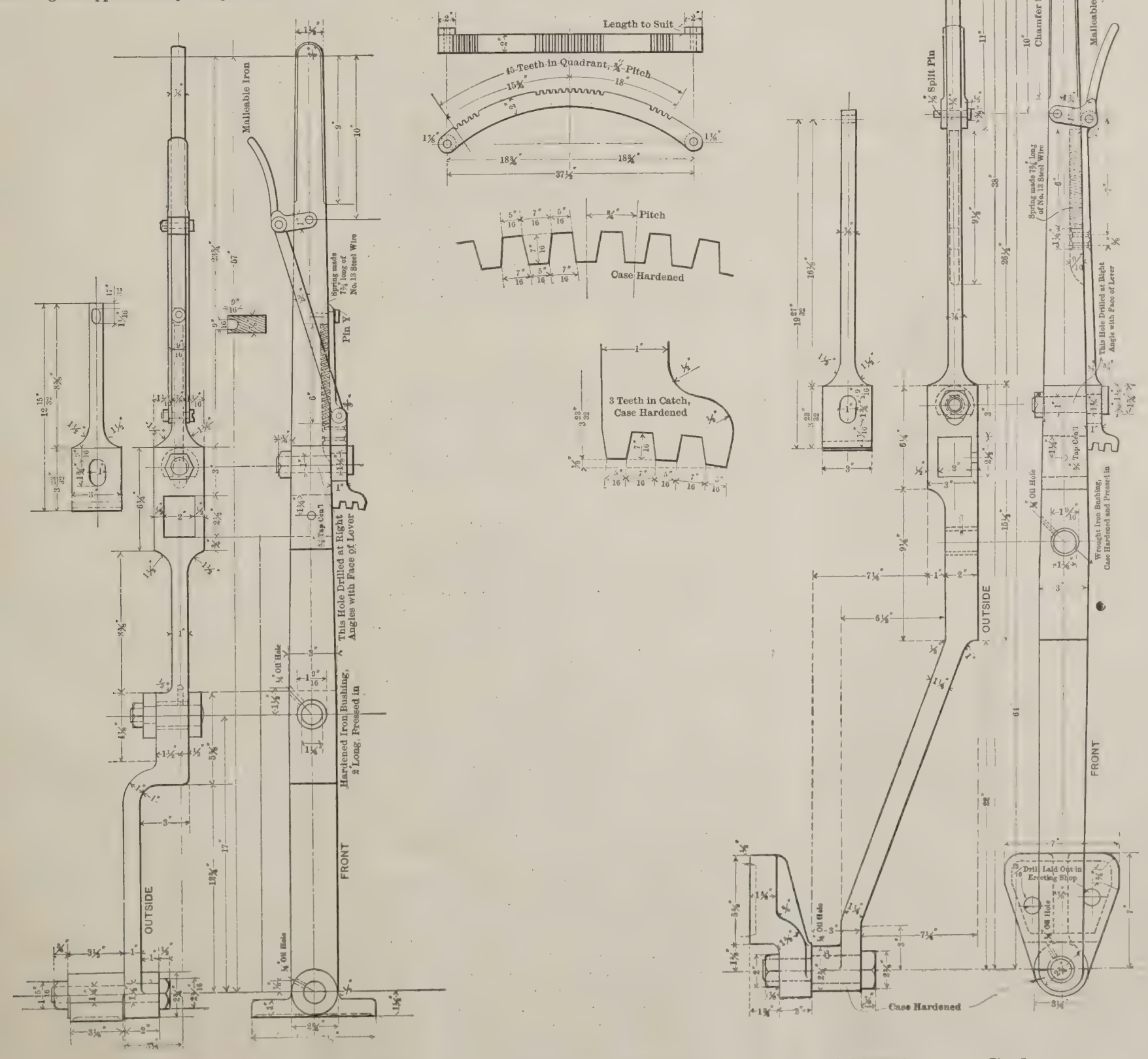


Fig. 4. STANDARD CLOSE NOTCHED QUADRANTS, SCHENECTADY LOCOMOTIVE WORKS. Fig. 5.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

IMPROVED APPLIANCES AND EDUCATION.

The letter of a Master Car Builder appearing in this issue relative to the intelligent operation that improved appliances in train and engine equipment need, in order to reap the full advantage the improvements give, touches a subject of great importance to every railroad mechanical officer.

The march of improvement in such appliances has been so rapid in recent years that there is no doubt it has traveled ahead of the learning and improvement of the general run of men who must operate them. Education is the remedy that some of the larger railroads have applied with eminent success, and it is the only one that can regulate the matter and give a safe and efficient service.

This matter was brought up for discussion at the last meeting of the Southern & Southwestern Railroad Club, and while some differences of opinion were expressed as to the extent of the instructions that should be given relative to air-brake practice, the general opinion was that actual schooling was absolutely necessary. The fact was mentioned that engineers are frequently provided with elaborately illustrated books on air-brake apparatus, but that comparatively little improvement has been shown from their use. Mr. Hartman, of the Westinghouse company, expressed the opinion that results from such books were very small, and said:

"Many engineers have often told me, when I asked them if they had been provided with instruction books on air brakes. 'Yes, sir; I did sign for the book, but I do not understand the cuts. Go ahead and handle the engine, and I will do what you do.' Some engineers study, but cannot decipher the intricacies of the sketches, and the books are not as efficient as the run of a few miles with a proper instructor."

The fact is that the value of books for the instruction of train and enginemen is seldom correctly estimated. Some believe they are useless because the men will not study them or be guided by them, while others suppose of course the books will do it all, and simply distribute them with possibly a bulletin board notice as an accompaniment. Both of these positions are entirely wrong. They occupy the barren extremities of what, in the middle ground, is a very fruitful field.

The true value of such books is found when they are used to supplement personal instruction, by an intelligent, capable and patient instructor. When so used they are read and re-read with interest by the men, and aid in making clear the different points presented for their consideration, and preserving the whole matter for future reference.

Any road that can afford to equip its rolling stock with improved appliances can afford to have their nature and proper operation explained to those who must operate them. The cost of such instruction is an insignificant sum compared with the improvement in the service effected.

IMPROVING LOCOMOTIVE DETAILS.

We have pleasure in illustrating on another page in this issue some improvements in locomotive details adopted by one of our large locomotive works. One is an improved throttle with a capacity largely in excess of the dry pipe, which is designed to give as nearly full boiler pressure as possible in the cylinders. The other is an improved reverse lever quadrant of long radius, and with the notches cut close together, designed to enable fine graduation of the cut-off of steam to the cylinders.

The two improvements have been adopted together and are certainly logical companions of each other, as full boiler pressure in the cylinders without the means of nice adjustment of cut-off is about as incongruous as a fiddle in a brass band, and, like the latter, would be (and is) throttled most of the time.

The refinement of locomotive details is a good field to work in, and is along the probable lines of best improvement. One of the best of these is provisions for adjusting the workings of the engine, in detail and in whole, to conform to the ever varying conditions of its work.

This applies to the water in the tank, and through all its changes in use as steam until it is expelled from the exhaust nozzles. Taking it as it leaves the tank valve it needs injectors with a wide range of capacity to properly regulate its feed to the boiler. Really in modern practice with the immense engines used and the large injectors required, the latter should be of different sizes to afford a wider range of adjustment than is possible in one. The supply of steam from the boiler to the cylinders needs means for the nicest adjustment of pressure in starting, and cut-off while running; and last, but still important, the escaping steam through the exhaust nozzle should have its force subject to easy control from the cab, and to such adjustment as may be most beneficial to the draft through the firebox in starting, and while running with different weights of trains, with different kinds of coal and over easy and difficult stretches of road. An English road using variable nozzles on 200 of its locomotives reports a saving of 3½ pounds of coal per engine mile over their record before being equipped with the variable nozzle.

What is true of regulating the supply of feed to the boiler, steam to the cylinders and the force of the exhaust, applies with little modification to the supply of fuel and air to the fire. An intelligent fireman is needed for the fuel, but the ordinary means of air admission and control are yet crude and inefficient.

The locomotive is such a self-contained machine, and is so interdependent upon the operation of its many parts that slight changes in apparently unimportant details affect the operation of the whole. Every act of the engineer, from changing the cut-off of steam to the cylinders, to oiling a bearing, affects the coal pile in the pit; and few changes in the construction of any part or member can be made without likewise affecting the economy of the engine. The improvement of details along the lines suggested will aid intelligent management, and when properly used will enhance the efficiency, cleanliness and economy of the engines.

THE SEPTEMBER WRECKS.

The many calamitous train wrecks that are constantly occurring and that are accompanied by the deplorable maiming and slaughter of people that shock the public and insult our civilization call loudly for safer methods of railroad operating, and in view of the frightful record of the month just passed it would seem that the most radical measures are necessary.

The record of train wrecks in September is one of the worst in recent years. The sun rose the first morning in the month only to witness the beginning of the harrowing record in the wreck that occurred that morning of the north bound fast mail train on the New York Central & Hudson River road at the New Hamburg drawbridge. The bridge was open, and distant and home signals set for danger, but the engineer heedlessly ran by the signals and into the open draw at such a high rate of speed that the locomotive leaped 28 feet across the space and landed on the opposite side. In the wreck resulting the engineer, fireman and a mail clerk were instantly killed.

September 5 a West Shore passenger engine was derailed while running about 30 miles an hour near Cranston, N. Y., and plunged into the Hudson River in 40 feet of water. The engineer and fireman were killed.

September 8 a head end collision between a work train and a passenger train occurred on the Cambria & Clearfield branch of the Pennsylvania Railroad, in which 9 people were killed and 6 injured.

September 10 claimed a rear collision of a fast running freight train of 30 cars with a standing passenger train at a station on the Fitchburg Railroad. Eight people were killed and about 30 injured. The freight engine telescoped the rear passenger car so far that its pilot reached beneath the front truck. It was a case of reckless running, hand brakes, and a dense fog that obscured the flagman's lantern and the block signal set at danger.

September 11 a freight train on the Central Railroad of New Jersey ran into a light engine at night and killed the engineer. The fireman of the light engine went back to signal the freight train, but his lantern went out just when it was most needed.

September 13 a hanging brake chain on one of the cars of an express train on the Pennsylvania Railroad caught on the point of a facing switch and displaced it far enough to catch a truck of the following car. The truck broke away from the train and ran into a waiting freight train on the side track, killing two men.

September 15 lap orders brought two trains in head end collision on the Chicago & Northwestern. Four men were killed.

September 21 in wrecks on three of the principal roads 18 people were killed and 32 seriously injured. A passenger train on the Pittsburgh, Fort Wayne & Chicago road crashed at full speed into a freight train that was running on the passenger train's time. Both engines and 5 freight cars were wrecked, and 5 of the cars of the passenger train were consumed by fire communicated from the engines. Ten people were killed and nine injured, two of the latter dying later. Most of the fatalities were due to the fire which roasted the imprisoned victims before they could be rescued.

The same day a passenger train on the Atchison, Topeka & Santa Fe was wrecked by train robbers near Osage City. The whole train of ten cars went over an embankment and the first six cars were telescoped. Five persons were killed and 24 injured.

The same day a head end collision on the Pennsylvania Railroad killed one man and injured another.

September 24, by a rear collision between a freight train and a work train on the Chicago & Great Western eight men were killed and three injured.

In the collisions here noted, which, of course, are only the more important ones of the month, 55 people were killed and 125 injured. The destruction of property must have been near $300,000. On top of this will come the inevitable damage suits that may make this sum look small. As an illustration of this, suits for damage aggregating $250,000 are now filed against the Lake Shore & Michigan Southern for the killing of eleven people and the injury of many others in the tunnel collision near Air Line Junction last winter.

The public must deal with train wreckers and robbers or endure the consequences, but the railroads must deal with open drawbridges, fogs that obscure signals, and the exaustion of train and engine men. These were the causes of the worst wrecks in September, and can surely be met by good progressive management.

LOCAL MASTER MECHANICS' ASSOCIATIONS.

A Master Mechanics' Association is to be established on the Northern Pacific road such as now exists on the Chicago, Burlington & Quincy and a few other roads, for the discussion of matters pertaining to the maintenance of the rolling stock on that road.

This is an eminently sensible move and one that will surely result in improvement of the service. It is surprising that all the large roads do not see the advantages to be gained by having the division master mechanics meet together to consider the many new and important matters pertaining to their department and work that are constantly coming up.

The Master Car Builders' Association and the American Railway Master Mechanics' Association can only give attention to matters that affect the interests of all American roads, and their field being so broad they can touch but lightly anywhere. The many purely local conditions that exist on every road must necessarily have local treatment, and there are always many such of sufficient importance on any large road to make discussion of them by the heads of the department under which they belong very desirable and valuable.

On a large road of our acquaintance, where the division master mechanics are widely separated and seldom meet the difference in their methods of doing work varies nearly as widely as if they were on different roads, whereas the interests of the road they serve require uniform methods in shop practice and in the maintenance of rolling stock. The very able superintendent of motive power on this road has rather a hard time to keep everybody in line and have standards adhered to, and general instructions faithfully and intelligently followed. This brief description of the actually existing conditions on one road applies without a doubt to many others. The trouble is not with the system, the organization or the men, but with human nature. There is not enough of intercourse and association.

It is a truth as wide in its application as the works of nature that isolation breeds changes. It is apparent in the personal appearance and in the dialects of our countrymen as in the people of other countries; and its final demonstration is in the nations and the languages of the human race. The fact is we all grow and keep growing mentally, some faster than others and some in different directions, and the only way we can maintain a community of interests and uniformity in practice is by constant association. Otherwise we are led by different paths.

On railroads where such associations as the Northern Pacific is about to inaugurate are already established, it is found that there is an *esprit de corps* of the highest character existing. It is much easier for men to follow intelligently a general order, or faithfully maintain a standard

when they themselves have had a hand in its adoption. Large roads that neglect to avail themselves of this advantage lose a good deal and load their mechanical superintendents with heavier burdens than are necessary.

THE THROTTLE.

The one thing about a locomotive that is of the greatest importance is the throttle. While content to get along with occasional attention from the roundhouse machinist, it demands of the engineer his first care when he enters the cab, his last care when he leaves it, and his unremitting attention while on the road. Generally neat and often handsome in design, and kept cleaner and brighter than anything else in the cab, the throttle lever is always an object of pride to the engineer and more or less of awe to laymen. To the experienced it reveals the character and capacity of the man who handles it. If ignorant, narrow minded, nervous or distrustful, or a "Young Man Afraid of His Horse," his hand always grasps the throttle which he never opens any more than he must. If intelligent, self-confident, and capable of easily comprehending all his duties he treats his throttle in a familiar liberal "we're-on-good-terms" manner, pulls it open liberally, and is content to rest his hand easily upon it, and occasionally leave it untouched. This proclaims a master.

There is something stingy and miserly looking in a throttle slightly open; although it is, in fact, a declaration of extravagance. But a throttle full or liberally open has an air of power and generosity, while in truth it is an assurance of economy.

Leaking and defective throttles have furnished many sensational stories of runaway locomotives, and of others breaking out of their quarters at night and trying to steal away, and numberless accidents have happened and lives been lost through such throttles. The song of steam that, after relating its usefulness to man, says:

"But harness me well with your iron bands,
Be sure of your curb and rein,
For I scorn the strength of your puny hands
As the tempest scorns a chain,"

has always seemed to apply with peculiar and distinctive emphasis to the throttle of a locomotive.

Aside from the matter of safety, how much of the efficiency and economy of the locomotive depends upon the throttle and the way it is used. Feared by many and misunderstood and misused by most runners, its office is the proud one of governing the greatest invention of man. What old engineer has ever forgotten the quickening of his heart beats when as a novice he first opened a throttle; or the later time when, after weary labor and waiting, he assumed the duties of the right hand side and laid his hand with swelling heart (and maybe head) upon his scepter, the throttle lever.

Many times Death has stood beside the throttle; and many faithful engineers thrust without a moment's warning face to face with the dread visitor have made their last act one of duty to humanity, and closed their throttles and their lives together.

Other steam engines have throttles, but they are all lifeless and uninteresting things compared with the throttle of a locomotive.

About the middle of September there was a good deal of talk and some appearance of an impending strike of engineers on the Philadelphia & Reading Railroad. This road has been so harassed with labor difficulties in recent years that it has adopted a rule not to take into its employ any members of labor organizations. Applicants for employment must declare that they belong to no such unions, and must agree not to join any while in the service of the company.

Some engineers were discharged for alleged violations of this agreement in joining the Brotherhood of Locomotive Engineers. In the conference that finally resulted between the President of the company and the Chief of the brotherhood the matter was settled by the reinstatement of one of the dismissed men, who proved he did not sign the anti-labor union agreement. The others who had signed the agreement and violated it remained dismissed.

It is greatly to the credit of those concerned that they recognized the justice of each other's claims and gave what was the due of each, thus averting what threatened to be another great strike like that on the C., B. & Q. in 1888. It is possible that both sides took council of wisdom from that strike, and concluded that peace was the better course.

The tests of a train equipped with journal brasses and with tubular roller bearings, the report of which is published in this issue, is worthy of the attention of all railroad men. We have assurance that the published report of these tests is practically correct, and the disposition of the railroad seems to be to test the matter thoroughly. A bearing that, despite many discouragements, has been able to do what this report shows is deserving of a thorough test. Reducing the resistance of trains is a much cheaper and easier way of handling increased traffic than building larger locomotives and cars, with the necessary improvements in roadbed, track and bridges.

English Railway Accidents in 1891.

The general report of the Board of Trade upon the accidents that have occurred on the railways of the United Kingdom during the year 1891 has been published. It shows that the number of persons killed in the working of railways during the year was 1,168 and injured 5,060. Of these 103 killed and 1,612 injured were passengers, while 549 killed and 3,448 injured were employés and other persons. In addition the companies have returned 79 persons killed and 6,440 injured from accidents which occurred on their premises, but not connected with the movement of railway vehicles. The total number of passenger journeys, exclusive of journeys by season ticket holders, was 845,563,668, or an increase of 27,719,622, as compared with the previous year.

According to these figures the proportion of passengers killed and injured during the year from all causes were one in 8,208,385 killed, and one in 524,481 injured. In 1890 the proportions were one-in 6,930,034 killed, and one in 600,840 injured. Twenty-four railway servants were killed and 267 injured while employed in the coupling and uncoupling of vehicles, while 136 were killed and 1,404 injured while employed in various other shunting operations; 19 were killed and 64 injured by being caught between vehicles, 17 were killed and 75 injured by falling between trains and platforms, 115 were killed and 108 injured while working on the permanent way and sidings, and 146 were killed and 259 injured while walking, crossing or standing on the line on duty. The accidents to persons passing over railways at level crossings show a considerable decrease on the figures for the previous year, the number being 66 killed and 31 injured against 83 killed and 35 injured in 1890. The number of trespassers was 306 killed and 161 injured, against 252 killed and 123 injured in 1890.

New York Railroad Club.

The first regular meeting of this club for the season of 1892–93 was held Thursday evening, Sept. 15, at 7:30 at the rooms of the American Society of Mechanical Engineers, New York City.

President Blackall was in the chair.

By the direction of the President the Secretary read a letter calling the attention of the club to a plan for having laboratory tests of locomotives made as a part of the transportation exhibit at the World's Fair. A resolution was offered to the effect that the President appoint a committee of three to draft a resolution expressing the sentiments of the club in this matter. Accordingly, the following resolution was drawn up and adopted :

Resolved: That the New York Railroad Club recognizes the desirability of undertaking a series of laboratory tests of locomotives in connection with the Transportation Exhibit at the World's Columbian Exposition, and that the club will be glad to aid in and support such tests in any way that is in its power.

Mr. Hugh Baines read a paper on "Rolling Stock and Its Relations to Track," and Mr. F. A. Stinard read a paper on "Boiler Scale and Purification of Feed-Water." The latter is given nearly in full on another page. There was but very little discussion of these papers.

The Drexel Railway Supply Company is now manufacturing the Barr vestibules, patented by J. W. Barr, Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul.

A locomotive on a logging railroad near Mobile, Ala., exploded Sept. 23. There were five men riding in the cab of the locomotive, and all were terribly scalded, two probably fatally.

For the year which ended Sept. 1 nearly fifteen and a half million bushels of grain were exported from New Orleans, which is ten times the number exported during the previous year.

A six-year-old boy, who said he wanted to see a big train wreck, turned a switch on the Big Four track, at Dayton O., Sept, 22, and the freight cars were piled up for his entertainment. No one was injured.

It is reported that the Philadelphia & Reading has decided to paint all its main and leased line freight, gondola, and coal cars black, with white lettering, in the same style that Lehigh Valley cars are painted.

A broken axle caused a wreck on the Cumberland Valley Railroad, at Middlesex, Pa., Sept. 12. Three coaches left the track and two were overturned. No person was killed, but several passengers were badly injured.

The Norfolk & Western recently received a train of 20 new baggage cars from the Pullman Car Company. They are fitted for use on vestibule trains, which will be run through on that road as soon as the Ohio extension is completed.

Arrangements have been completed whereby excusion trains to the World's Fair, by whatever road they may arrive in Chicago, will run within the Exposition grounds and discharge their passengers there. No transfer of passengers at any point will be necessary.

"Railway Car Construction."

(From the Railway Age and Northwestern Railroader.)

The scope of this excellent work is well outlined in its title. Its author, William Voss, is widely known for his attainments as a designer and builder of cars. To him we are indebted for the only book of its class that we know of. The invaluable Car Builders' Dictionary occupies a field distinctively its own; and this most admirably supplements it by giving in detail, with elaborate descriptive text, a series of scale drawings of cars and parts of cars, almost entirely prepared from original sketches. The text is not merely descriptive matter, but embodies a vast amount of critical and suggestive comment upon the design of freight and passenger car bodies, trucks, drawbars and attachments and fittings of all kinds.

In addition to this general treatment of the subject in all its phases—occupying 122 pages—there are 34 pages given up to full description and illustration of the standard Pullman and Wagner cars and the standard passenger cars of the Pennsylvania, New York Central and Boston & Albany railways. Throughout the entire work the author refrains from advancing new theories, simply presenting some leading methods of construction; nor does he seek to present a design for an ideal car. But to those who desire to have at hand, in compact and convenient form, information as to design and dimensions of cars and the parts thereof, as followed in the best current practice, this work is simply invaluable. The book comprises a series of articles originally appearing in the NATIONAL CAR AND LOCOMOTIVE BUILDER. In the matter of type, engraving, press-work and binding the book leaves little to be desired.

Peat has been permanently adopted as fuel for the locomotives on the Vadstena-Oderhouse Railway in Sweden after a series of exhaustive tests to determine its relative value as compared with coal.

The contract for the completion of the railroad which is to connect the city of Medellin, Colombia, with the town of Puerto Berrio, on the Rio Magdalena, a distance of 150 miles, has been let, and a corps of engineers have begun operations.

The sum of $130,000 has been voted by the citizens of Lafayette, Ind., for the removal of the shops of the Louisville, New Albany & Chicago company to that city. The company is said to have agreed to expend $200,000 in addition to the money subscribed. The shops will employ 600 men.

Space at the World's Fair has been requested for the exhibition of the famous old locomotive "General," which was captured by the Andrews raiders during the war, and for the taking of which they were executed. This locomotive is in the possession of the Nashville, Chattanooga & St. Louis Railroad.

It has been proposed to place two 100-c. p. incandescent lamps in front of each of the twenty-five windows which form a coronet on the Statue of Liberty in New York Harbor ; these to be protected from the weather in glazed lanterns with reflectors at the back. Under the balcony of the torch an arc lamp of 2,000 c. p. is proposed with reflectors arranged to throw light on the face of the statue and also to throw a beam of colored light vertically upward.

The American Iron and Steel Association has received from steel manufacturers the statistics of the production of Bessemer steel ingots and Bessemer steel rails in the United States in the first half of 1892.

The increase in the production of Bessemer steet ingots in the first half of 1892, as compared with the second half of 1891, was over 13 per cent., while the increase in the production of Bessemer steel rails in the same period was over 10 per cent.

Teak wood, which has passed into proverb as the best material for ship building, is superior to all other woods for such purposes, from the fact that it contains an essential oil which prevents spikes and nails driven into it from rusting. This property is not possessed by any other wood, and furnishes an explanation of the fact that ships built of teak are practically indestructible. Some have been known to last 150 years, and when broken up their beams were as sound as when first put together.

The Western Railway of France during the late holidays had so many passengers by the cheap excursion trains that the rolling stock was insufficient for the service, and on the line from Havre to Montivilliers several cattle vans had to be used for the conveyance of passengers. Some of these, not feeling flattered at the accommodation, set up a bellowing like bulls, and when the ticket collector came for their tickets they replied by noises such as might be made by the ordinary occupants of the carriages in which they were. Upon the arrival of the train at its destination they refused to quit the station except by the cattle entrance, and when remonstrated with by the station master they butted him like rams. The station officials were compelled to yield to the passengers who took this strange, but withal jocular, means of expressing their displeasure at the treatment they had received at the hands of the railway company.

Personal.

Mr. Orlando Stewart has resigned as Superintendent of Motive Power of the Fitchburg Railroad.

Mr. W. V. S. Thorne, Superintendent of the St. Cloud car shops of the Great Northern, has resigned.

Mr. David Bruce, the inventor of the type-casting machine, died in Brooklyn, N. Y., on Sept. 13, at the age of 90.

Mr. J. G. Butterfield, who has been Master Mechanic of the Sioux City & Northern ever since the road was built, has resigned.

Mr. John Medway has been appointed Superintendent of Motive Power of the Fitchburg road, in place of Mr. Orlando Stewart, resigned.

Mr. John Hawthorne has been appointed Master Mechanic of the Chicago & Erie at Huntington, Ind., vice Mr. Thomas A. Lowes, resigned.

Mr. George W. Buck has been appointed Master Mechanic of the Fergus Falls and Breckinridge divisions of the Great Northern, with headquarters at St. Paul, Minn.

Mr. George H. White has been appointed Superintendent of Motive Power and Machinery of the Duluth, Mesaba & Northern road, with headquarters at Stoney Brook, Minn.

The office of Mr. J. O. Pattee, Superintendent of Motive Power of the Great Northern railway system, has been moved from the shops to the company's general office building on Third Street in St. Paul.

Mr. Leonard W. Squire, in addition to his duties as chief clerk in the office of Superintendent and Master Mechanic, has been appointed Purchasing Agent of the Cleveland Lorain & Wheeling, with office at Lorain, O.

Mr. George W. Ristine, formerly general manager of the Erie Despatch freight line, has been appointed general manager of the United States Car Company, formerly known as the United States Rolling Stock Company.

Mr. Edwin McNeill, formerly Superintendent of the Pacific division of the Union Pacific, has been chosen assistant to the President of the Iowa Central, and will have charge of the development of the coal properties along the road.

Mr. Michael Gilles has been appointed General Superintendent of the Louisville, New Orleans & Texas. He has been Superintendent of the Iowa Division of the Illinois Central since 1883, and has been connected with that company for over 30 years.

Mr. S. W. Simonds has been appointed Engine Dispatcher of the Fitchburg Railroad at Boston. Mr. Simonds has had an experience of 16 years on the Boston & Maine Railroad, and is well fitted for the position.

Mr. Albert Griggs, for some years Superintendent of Motive Power of the Providence & Worcester road and more recently holding the same position on the New York & New England road, has entered the service of Page, Newell & Co., of Boston, as agent for the "Brunswick" car and locomotive wheels.

Mr. George Vernon, who died at Bordentown, N. J., on Sept. 2 at the age of 87, had been in the employ of the Camden & Amboy Railroad and its successor, the Pennsylvania, for nearly 60 years, for most of which time he was a locomotive engineer. He first ran a locomotive on the Newcastle (Delaware) road in 1831.

Mr. E. Dawson, heretofore foreman of the shops of the Chicago & Northwestern at Council Bluffs, Ia., has been appointed Assistant Master Mechanic of the Fremont, Elkhorn & Missouri Valley and Sioux City & Pacific roads, with headquarters at Missouri Valley, Iowa.

Mr. J. H. Barrett, who resigned as Superintendent of the Erie division of the New York, Lake Erie & Western last spring, has been appointed General Superintendent of the Buffalo, Rochester & Pittsburgh, with headquarters at Bradford, Pa., to fill the vacancy caused by the resignation of Mr. George H. Bartlett.

Mr. Henry S. Small, a locomotive engineer for forty-four years, and since 1869 in the service of the Central Pacific, is dead. Mr. Small was engineer of the famous Jarrett & Palmer special which made the trip from New York to San Francisco in eighty-three hours. He took the train from Ogden to Oakland—879 miles—in twenty-three hours and forty-five minutes.

Mr. James T. Leighton, a well known supply man, formerly a master car builder, and member of the M. C. B. Association, dropped dead in the city of Portland, Me., on Aug. 24. He was a native of Portland, and was on a visit to that city, where he had not been since his boyhood, about 55 years. He was a partner in the old New Haven Car Works about twenty years ago, and was connected at various times with the Jackson & Sharp Company, the old Baker Heating Company and the Sewall Steam Heating Company.

Mr. David W. Rider, who has been General Superintendent of the Jacksonville Southeastern lines for about three years, resigned recently, and has been succeeded by Mr. C. A. Henderson, who has been connected with the operating department of the road for some time. Mr. Rider was formerly Secretary and Chief Clerk of Receiver McNulta of the Wabash, and some time after the lines now forming the Jacksonville Southeastern were separated from that system he became General Superintendent. He was also Superintendent of the Peoria & Pekin Union road in 1881, and he has served as brakeman, conductor, yardmaster and station agent on Western roads.

Master Car Builders' Association Notes.

The following is an announcement of the results of the letter ballot of the Master Car Builders' Association, on "Change in Wheel Guarantee," and "M. C. B. Coupler Gages," which were closed Aug. 31:

SUBJECTS VOTED ON.	Question.	Number votes cast. Affirmative.	Negative.	Total.	No. votes necessary for adoption.	Results of Letter Ballot.
Change in Wheel Guarantee	a	503	311	814	543	Rejected.
M. C. B. Coupler Gages	b	764	49	813	543	Adopted.

There is therefore no change in the Standard Wheel Guarantee as printed in the proceedings of 1891. The M. C. B. Coupler Gages adopted as standard by this letter ballot are the gages shown in the Executive Committee's circular of September, 1891, and also shown in the circular relating to letter ballots. These gages will be shown in the proceedings of 1892.

Committees on M. C. B. Standards.

In accordance with the recommendations of the Committee on M. C. B. Standards in its report to the convention in 1892, and in pursuance of instructions from the convention to the Executive Committee, the following committees have been appointed:

Drawbars and Brake Beams.—To consider the suggestions of the Committee on Standards, as to standard height of drawbars, and as to standard form of brake-beam, and report with recommendations and drawings in detail. E. D. Nelson, John Bean, J. R. Rankin, C. A. Schroyer.

Axles, Journal Boxes, Lids, and Wedges.—To consider the suggestions of the Committee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. R. H. Soule, W. H. Day, W. H. Lewis.

Truck Pedestals and Safety Chains.—To consider the suggestions of the Committee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. T. A. Bissell, Wm. McWood, A. E. Mitchell.

Protection of Trainmen, and Lettering Fast Freight Line Cars.—To consider the suggestions of the Committee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. E P. Lord, Robert Walker, Thomas Sutherland.

Tests of M. C. B. Couplers.—To arrange for and conduct the tests, as proposed by the committee of 1892 and approved by the convention, and to consider and report upon all other questions connected with the M. C. B. Coupler which they might consider advisable, with the exception of the attachment at the rear end of the coupler and the form of the coupler at that point. To confer with the Committee an Attachment of M. C. B. Couplers to Cars. J. M. Wallis, J. S. Lentz, R. D. Wade, J. H. McConnell E. Chamberlain, T. G. Duncan.

Attachment of M. C. B. Couplers to Cars.—To recommend a form, in detail, of M. C. B. Coupler at rear, and so as to take yoke, tail bolt and continuous drawbar attachments; also, to consider and report upon the best form of draft attachment to cars. To confer with Committee on Tests of M. C. B. Couplers. E. D. Bronner, W. H. Harrison, A. M. Waitt, Wm. Garstang, A. Dolbeer, Jno. H. Davis.

Metal for Brake Shoes.—To investigate the relative friction and wear of different metals and different shoes in general use on chilled treads and on steel tires. Wm. Forsyth, Benjamin Welsh, F. D. Adams.

Cast Iron Wheels.—To investigate and report whether there is any substantial difference in wheels made by different methods, such as by solid chills or contracting chills, or by any other difference in process of manufacture. G. W. West, W. H. Thomas, Jno. Player.

Steel Tired Wheels.—To investigate further, and report with all data available as to relative values in service. R. E. Marshall, J. O. Pattee, C. H. Cory.

Airbrake Tests.—To further investigate and report in detail what tests are desirable to insure best available service. G. W. Rhodes, E. B. Wall, Geo. Gibbs, A. S. Vogt, E. A. Williams.

Freight Car Truck Frames.—To include in its report the relative advantages of fixed bolsters and swing bolsters. J. C. Barber, W. S. Morris, S. A. Crone.

Steel Center Sills.—To consider and report whether the use of steel for center sills in freight cars would be desirable. D. L. Barnes, J. N. Barr, J. D. McIlwain.

Steam Heating and Ventilation of Passenger Cars.—To review the report of last year's committee on this subject, which was acted on provisionally, and to recommend any changes that may be deemed proper; also to further pursue the subject of steam heating in general, informing the Association as to what improvement, if any, is being made over the methods now in use. L. B. Paxson, J. J. Hennessy, Jos. Townsend, John Hodge, David White.

Master Mechanics' Association.

Following is the announcement of subjects at the next convention of the Master Mechanics' Association, and the committees thereon:

Exhaust Pipes, Nozzles and Steam Passages.—Committee: C. F. Thomas, A. W. Gibbs, S. Higgins, J. M. Wallis, Geo. W. Smith, Robert Quayle, John Y. Smith.

Standard Tests for Locomotives.—To investigate the practicability of establishing a standard system of tests to demonstrate the fuel and water consumption of locomotives. Also to ascertain the value of the steam engine indicator in locomotive tests. Committee: J. N. Lauder, W. J. Robertson, Albert Griggs, John D. Campbell, F. W. Dean.

Compound Locomotives.—To investigate the relative economy of compound and simple locomotives; also the most valuable form of compound locomotive. Committee: George Gibbs, William H. Lewis, Pulaski Leeds, James Meehan, T. W. Gentry, A. T. Woods. Auxillary Committee: S. M. Vauclain, Baldwin Locomotive Works; Reuben Wells, Rogers Locomotive Works; H. N. Sprague, Porter Locomotive Works; A. T. Pitkin, Schenectady Locomotive Works; Joseph Lythgoe, Rhode Island Locomotive Works; F. J. Leigh, Canadian Locomotive Works; D. A. Wightman, Pittsburgh Locomotive Works; H. Tandy, Brooks Locomotive Works.

Tests of Steel and Iron.—To investigate the critical temperature of steel and iron. Also any other question relating to steel and iron that the committee may consider of value. Committee: William Smith, J. N. Barr, A. W. Quackenbush, P. H. Peck, D. L. Barnes.

Uniform Locomotive Performance Sheets.—To report on the practicability of establishing a system for recording the performances of locomotives that will fairly represent the work done. Committee: George F. Wilson, J. S. McCrum, John Player, James McNaughton, John A. Hill.

Standard Diameters for Wheel Centers and Tires.—To report on dimensions of wheel centers for driving wheels larger than the standard; also to investigate the means of securing uniformity in rolled outline of standard tires. Committee: A. E. Mitchell, W. C. Ennis, Thomas Millen, C. A. Thompson, L. R. Pomeroy.

Boiler Attachments.—How can the safety of these be increased and how can the number of holes in boiler be lessened? Committee: James Macbeth, A. A. Dolbeer, J. M. Boon, W. A. Foster, M. N. Forney.

Malleable Iron Castings.—To what extent can these be used to take the place of expensive forgings? Committee: R. H. Soule, W. Garstang, W. H. Thomas, C. H. Cory, W. D. Crosman.

Attachments Between Engine and Tender.—Suggest improved form that will prevent the tendency for the tender to mount the foot-plate; also to report on foot-steps and hand-rails. Committee: J. Davis Barnett, G. W. Stevens, C. E. Smart, W. S. Morris, L. S. Randolph, L. F. Lyne.

Smoke Prevention.—Recommend methods of smoke prevention that will satisfy municipal requirements in cities. Committee: J. N. Barr, F. Mertsheimer, T. W. Gentry, Wm. McIntosh, W. H. Marshall.

Tender Frames.—Report on best form of tender and truck frames of wood and iron. Committee: R. C. Blackall, John Mackenzie, E. E. Davis, T. Purves, Jr., F. B. Miles.

It is understood that there has been an agreement by which the control of the San Antonio & Aransas Pass Railroad has been acquired by the Southern Pacific Railroad.

The Fort Plain & Richfield Springs Railway Company was incorporated at Albany, N. Y., in August, with a capital of $300,000, for constructing a standard gage railway about 30 miles long, from Fort Plain to Richfield Springs, with a branch to Palatine, Montgomery County.

The San Francisco & Denver Railroad Company has filed articles of incorporation at Sacramento, Cal. The object is to construct a standard gage road from a suitable point on the San Francisco Bay in Alameda County, in a general easterly and southerly direction, to a convenient point on the State line between California and Nevada. The length of the proposed line is about 800 miles. The capital stock is fixed at $12,000,000, of which amount $300,000 has now been subscribed.

Communications.

A Query.

Editor National Car and Locomotive Builder:

I desire to ask some one of the many readers of your valuable journal what has been their experience with air brakes on both sides of all wheels in four-wheel trucks under passenger cars.

Are the trucks evenly balanced and tilting prevented? And will this manner of application of the brakes prevent the unseating and shifting of the journal bearings?

With the present powerful quick acting air brake properly adjusted and bearing on the outside only of wheels, the tendency is to pull the wheels inward.

"Inquirer."

Improved Appliances Demand Intelligent Manipulation.

Editor National Car and Locomotive Builder:

The present age is one of progress, and the efforts of men to excel each other creates rivalry and a greater zeal in promoting the business interests of railroads and manufacturing concerns. It is un-American to be otherwise.

Men vie with men for a place in the front rank of progress by putting in tangible form the fruit of their thoughts and study in science and arts, and after the molding and shaping is done as a result of head work the operator or hand worker takes hold. Thus two classes of labor, namely, head work and hand work, are brought upon the stage of action, each equally as necessary as the other. But the ingenuity of one class is in advance of the other, and this accounts largely for the ineffectiveness of some of the railway appliances of this age. Not because of imperfection of the appliance, but for the want of diligence on the part of the operator in its management. Therefore, the least complicated and more automatic an appliance is, the better it is. But, however, close attention is absolutely necessary in operating the equipment of a railroad in order to get the benefit of its many improvements.

A railroad company spending money to equip its trains with what is necessary for comfort and safety should be rewarded accordingly, and in order to accomplish this, employees should be specially trained in handling the many improved appliances used, especially air brakes.

This appliance is the most important next to steam, in a well equipped train, and under certain conditions is as important comparatively in stopping a train as steam is in starting one. While speed is necessary, it is yet equally as important to stop as to start. Hence the necessity for training men for this particular branch of work, and men should be awake and alive to the interests of their employers by the exercise of diligence in the discharge of their duties.

Railroads are making good progress in equipping cars with comfortable and safe appliances. But the men handling the cars do not seem to understand how vitally important it is to keep well informed concerning all such improvements, the knowledge of which is easily obtained by a little effort. However, some railroads are making strenuous efforts to train their men for specific purposes, and with some success; but, generally speaking, improvements are adopted faster than the men are educated to properly appreciate and intelligently handle them.

Automatic couplers, air brakes, steam heating, etc., can be forced upon cars by the law makers, but knowledge cannot be forced into men so quickly as to how to operate to good advantage these appliances, and subserve the interest of all concerned. This must be done gradually and with patience and perseverance, and when accomplished the inventor and operator will stand abreast and the good results that will naturally follow will be specially advantageous to the railroads.

Master Car Builder.

The Servis Tie Plate.

Editor National Car and Locomotive Builder:

When the recent criticisms and charges were made against the Servis Tie Plate, in which it was charged that accidents had occurred because of the track spikes shearing the same, we preferred to remain silent until the charges had been thoroughly investigated by others, as we knew them to be malicious fabrications.

The report was by no means new to us, for we had frequently been informed by different railroad officials that such charges were being made by a former representative of this company, who is now pushing the claims of a rival plate. In deference to the wishes of the officials giving us the information, who for obvious reasons were averse to being drawn into such a controversy, we simply confined ourselves to a searching inquiry of the facts and in every case they were found to be maliciously false, possessing not even a foundation of truth. Without exception, these charges were traced to the same source.

It was the knowledge that there was no truth in the charges which led us to demand the particulars concerning them, and the place and circumstances of reported failures, and when the B. & O. and C., R. I. & P. Ry. systems were mentioned it proved our conjectures well founded, for the causes quoted were the identical ones which had been brought to our attention more than a dozen times. We also felt that our specific denial would lead to a thorough investigation of the matter and on that rested, fully assured that it would result, as time has proved, in a complete vindication,

While the result, in this respect, is all we could desire or ask, we feel it our duty to warn our patrons and those who are investigating the merits of any tie plate, against further impositions and statements that are without the slightest particle of truth, and, while we feel that the ultimate outcome of such contemptible methods must necessarily react, we would be derelict indeed to the interests of our customers, as well as unjust to those who are engaged in a serious investigation of the question, did we not make the following brief statement, which will suffice:

Upon the 9th day of February, last, the Chief Engineer of a prominent railway system mailed a letter of inquiry to this company, addressed to a former representative, whose connection with this company, unknown to the official, had just been severed. When the letter was received at the New York office it was sent by a messenger to the party addressed, with a request that if it pertained to the business of this company, the letter be returned. The reply came that the communication was purely personal. Upon investigation and bringing the matter up to the writer of the letter, who showed us his impression copy, we found that the letter was addressed to the company through this representative, and was in every sense a business letter, which noted that a correspondent had mentioned accidents on the B. & O. and C., R. I. & P. Rys. because of the Servis Tie Plate and wanted information concerning same, expressing fears concerning the use of plates should such reports be true.

This letter of inquiry, which was originally written with a desire for information, was withheld from us, and has since been repeatedly exhibited as a statement of fact voicing the sentiments of the writer and as an evidence of the failure of the Servis Tie Plate.

We have no comment to pass upon the characterless methods above described, but will leave to your readers the determination of the value of such testimony.

Yours very truly,

The Q. & C. Company.

Effects of Using Ill-Fitting Flue Plugs.

Editor National Car and Locomotive Builder

I have been thoroughly convinced lately of the bad effects of using cast iron flue plugs. We have had considerable trouble with leaky flues lately and a great many of them with bead entirely gone necessitating plugging. I have found that cast iron plugs are hardly ever exactly round, and when they are driven into the flue they do not fit and stop the leak because they are not round. This necessitates heavy driving to stop the leak and as a consequence the flue and flue sheet must conform to the plug. This, of course, is all very well until the engine goes to the shop for new flues. To put a new flue into this distorted hole in the flue sheet and make it tight—"Aye, there's the rub." It may be said that a cast plug with copper ferrule will overcome this difficulty but I think not. I have tried plugs that have been turned up and find that with them very light driving stops the leak and the flue sheet cannot be damaged. Considering the expense all around, I am inclined to think that plugs should be turned up for use.

I have read lately of the liability of the beads burning off in shallow fireboxes. I will say that the cases referred to above are in shallow fireboxes, but I do not think that beads burn off in shallow fireboxes any more than they do in deep fireboxes. These beads always disappear on leaky flues. It is partly caused by corrosion, but in flues that are continually leaking and cannot be made tight by rolling or expanding it is caused by beads being calked to death. Beads on flues in shallow fireboxes that do not leak do not burn off.

M. E. W.

Invention of the Locomotive.

Lord Kelvin, in unveiling the bust of William Murdoch at the Abbey Craig Monument, recentlysaid that Murdoch invented the locomotive steam engine. He made an engine 20 inches long by 14 inches high, put a high-pressure steam boiler on it, and began driving it on a road in Redruth, where he was then living. The locomotive ran off from its inventor on a gloomy night, at the rate of 6 to 8 miles an hour. It soon outran the inventor, and then the night air was rent by a succession of frightened cries for help. Murdoch, hurrying up, found the worthy rector, who heard a puffing and snorting, saw only a fiery eye rushing along not much above the level of the ground. He would not say what the rector thought he saw. After that Murdoch went about from mine to mine on a steam locomotive of his own construction, and it seemed to Lord Kelvin very much because there were so many objections to his idea that he did not anticipate George Stephenson by 20 or 30 years in the great work the latter did for the world.

The Source of Asphaltum.

An interesting account of the base of supply of asphaltum is given by the *Street Railway Journal*, from which it appears that the larger portion of this material in commercial use comes from the island of Trinidad, which lies off the coast of Brazil, in the South Atlantic ocean. On this island is the wonderful Pitch Lake, located about one mile from the sea, at an elevation of 138 ft., covering an area of about 115 acres.

The surface of the lake is sufficiently firm to support the weight of the loaded carts. The asphalt is mined for commerce from different parts of the lake, to a convenient depth of about three feet. It is easily excavated with picks, loaded directly into carts, and hauled to the shore ready for shipment. A marked peculiarity of the pitch lake is, that the pits or excavations made during the day fill up during the night, and in a few days no trace of them can be found.

The surface of the lake has an inclination of a few inches in one direction, sufficient to drain off the frequent rainfalls. Besides this slight inclination, the surface has a fall of a few inches from the center toward all sides. Another and distinct characteristic is that the surface is not flat and even, but is formed of irregular, oval shaped, flattened domes, or slightly convex surfaces, separated by channels of water, a few feet wide and a few inches deep, flowing toward outlets. There are several small islands, from 50 to 60 ft. in diameter, scattered over the surface of the lake, and resting on the asphalt itself. These islands have sufficient depth of soil to support the growth of quite large trees. The whole appearance of the lake is very odd, strange and difficult to describe. In color it is a dark chocolate brown, and looks very much like a patch of mushroons, flattened out and pressed closely together. In the center of the lake is a space of several hundred square feet of soft, fluid asphalt. Here the temperature is colder than in the solid parts of the lake. This "spring" is commonly, but erroneously, thought to be the source of supply. In fact, it is the last of the asphaltic deposits, and is ages more recent than the deposits of "iron" and "land pitch," and much more recent than the solid part of the lake itself.

Locomotives on British Railways.

According to a recently compiled and published table the following shows the number of locomotives on the various railroads in Great Britain :

Name of road.	No. of locomotives.
London & Northwestern	2,648
Midland	2,020
Great Western	1,660
Northeastern	1,560
Lancashire & Yorkshire	1,127
Great Northern	907
Great Eastern	879
Caledonian	690
North British	677
Manchester, Sheffield & Lincolnshire	655
London & Southwestern	570
London, Brighton & South Coast	410
Southeastern	378
Glasgow & Southwestern	301
London, Chatham & Dover	201
Taff Vale	189
Great Southern & Western of Ireland	178
Great Northern of Ireland	137
North Staffordshire	134
Furness	123
Midland Great Western of Ireland	111
North London	104
Highland	85
Great North of Scotland	77
Metropolitan	71
Rhymney	66
Somerset & Dorset Committee	61
Belfast & Northern Counties	61
Cambrian	59
Hull, Barnsley & West Riding	56
Metropolitan District	54
Barry	53
Dublin, Wicklow & Wexford	51
Waterford & Limerick	42
Brecon & Merthyr	30
London, Tilbury & Southend	30
Maryport & Carlisle	27
Newport & South Wales	24
Belfast & County Down	20
Cork, Bandon & South Coast	16
Wrexham, Mold & Connah's Quay	16
Mersey	15
City & South London (Electric)	14
Severn & Wye	13
Waterford & Central Ireland	13
All other companies have each less than a dozen engines	
Totals—England and Wales	14,314
Scotland	1,841
Ireland	705
Total locomotives	16,860

The Cleveland & Marietta is in the market for 300 30-ton coal cars.

The Philadelphia & Reading Railroad Company have placed an order with the Baldwin Locomotive Works for ten compound consolidation locomotives for service on the Lehigh Valley system. They will be used on the new line to Buffalo. These engines have boilers 66 inches diameter; fire-boxes 114 inches long by 96 inches wide with combustion chambers; driving wheels 55½ inches diameter; tenders of 4,000 gallons capacity ; two high pressure cylinders 14x25 ; two low pressure cylinders 24x26 ; estimated weight in working order about 142,000 lbs.; estimated weight on driving wheels about 126,000 lbs.

They are fitted with the Westinghouse automatic driver and tender brake, steel-tired truck and tender wheels with Vauclain wrought iron centers, Nathan lubricators, and wristpins bored and oil tempered ; also iron tender frames. Jerome metallic packing, and roof over tender. They will be completed the latter part of November.

Electric Locomotives.

The illustration presented herewith is that of one of two powerful electric locomotives, built during the latter part of 1891 for the City & South London Electric Ry. by Messrs. Siemens Brothers & Co. We take the description and reproduce the illustration from *Engineering*.

Each locomotive carries two motors, and the use of all gearing is obviated by winding the armatures of the motors on the axles of the wheels of the locomotive. The motors for the two locomotives were tested before they were fitted into their places by means of a Prony brake.

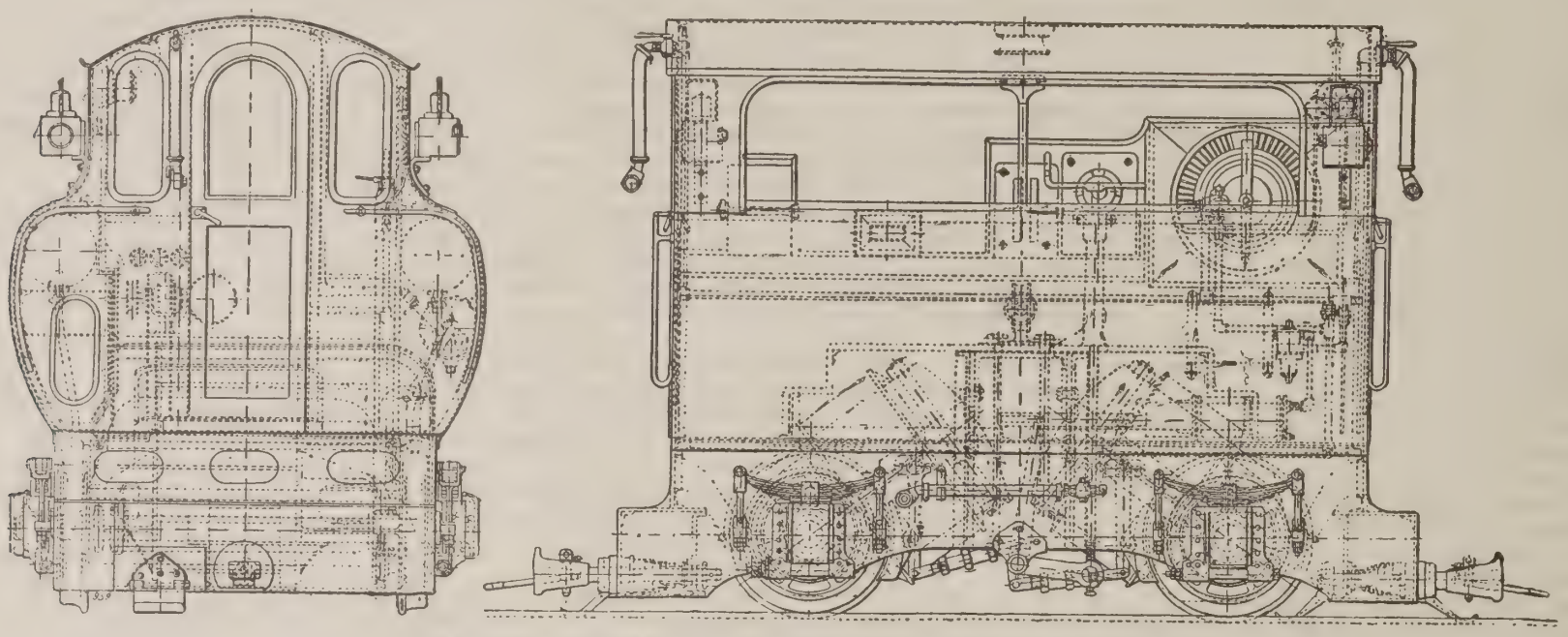
The side frames, floor-plate, and cab are all of steel; the wheels are of cast iron with steel tires and axles; the hornplates are of steel riveted to the side frames. Chief dimensions: Length, 14 feet; width, 6 feet 3 inches; height from rails, 8 feet 5½ inches; gage, 4 feet 8½ inches. The locomotive runs on two pairs of wheels having a wheel base of 6 feet; the wheels are 2 feet 3 inches in diameter. These locomotives are fitted, in addition to hand brakes, with Westinghouse brakes; the air reservoir, which serves for the carriage brakes as well, has a capacity of 17 cubic feet, this being sufficient for one up and down journey; the pressure is 110 pounds per square inch. The locomotives are fitted with central buffers and are lighted by glow lamps.

The current is collected from the conductor, which is in the form of a central rail, by a sliding contact shoe fitted at each end of the locomotive.

These locomotives are constructed to develop 100 brake horse-power at a speed of 25 miles per hour. There are two Siemens H. B. type motors with drum armatures on each locomotive. The armatures are built directly on the wheel axles and are coupled in series. The electro-magnets are suspended at the yoke end from a girder built into the locomotive frame, the polar ends being carried by gun-metal brackets and bearings, which rest upon the axle. Inside the cab is fitted the controlling gear, comprising one main switch for stopping, starting, and regulating the current, a reversing switch, a plug commutator for the connections to the magnet bobbins, a main cut-out and a main switch; an ammeter is also fitted, and a tachometer to show the speed in miles per hour.

When the train is started, the current is regulated by the driver, so as not to exceed a certain amount, by means of switches inserting resistances into the main circuit, but these resistances are cut out within half a minute of starting, so that the waste of energy in the resistances is kept as low as possible. Each locomotive fully equipped weighs 13½ tons, and the weight of the train of carriages it has to draw is about 21 tons. To this the weight of the passengers has to be added.

Since the two locomotives have been set to work on the railway they have had to keep the same time as the others, so that their full power cannot be utilized, but it has been found that their efficiency is satisfactory in every respect.



ELECTRIC LOCOMOTIVE, CITY & SOUTH LONDON RAILWAY.

President Ives' Fast Ride.

Three or four years ago President Ives, of the Burlington, Cedar Rapids & Northern Railroad was coming down the road in his special after an inspection tour to Sioux Falls. Chief Engineer White, General Pasenger Agent Hannegan, General Freight Agent Utt, and the President's son, Charlie, who has now become General Freight Agent, were among them on the old special car No. 101. The equipment of the road was not in as good condition then as now, but President Ives believed it was a better roadbed than the New York Central had. He would pin his faith to that any time, and nobody conected with the road ever thought of differing with the "old man."

Now, between Livermore and Goldfield there is a good long stretch of straight track which swings off in a sharp bend at Goldfield, just as the bridge over the Boone River is reached. The Boone is not a large stream anywhere, and up here near its headwaters it is a pretty small waterway to be called a river. Still, it is big enough to have a bridge over it, and that is something. Now, all the way down the party had been sitting in the cosy little office at the end of the car, looking out over the track, spinning yarns and smoking, and every little while President Ives would growl out something about the slow time the train was making.

At last, when Livermore was reached, and a stop made to take water, he said to his son: "Charlie, go ahead and tell the engineer to pull her wide open; I'm getting tired of this slow time." Charley obeyed with cheerful alacrity. No message ever lost any of its redundant accessories when he carried it, so he went up to the engine and yelled: "Dave, the old man says he wants you to pull her wide open, or he'll raise hell. He says if you're afraid to run the train he'll come up himself."

"Oh, he will, will he?" replied old Dave Funk. "Well, I'll shake him up, I guess."

When the train started there was a jolt that nearly cracked the coupling-pins and Livermore was out of sight in about a minute. Before the train had gone two miles, General Passenger Agent Hannegan said: "That's a deuced big herd of cattle grazing over there." The fact was that there were several herds of cattle, but the velocity of the train merged them into one. The farm-houses, which were never nearer than a mile apart, began to look like a row of city flats. All this time the inmates of the special car were being tossed about the car like a dollar in a basket. Chief Engineer White had his watch in his hand, and was vainly trying to count the telegraph poles, so as to gage the speed of the train, General Passenger Agent Hannegan was hanging on to a windowsill with both hands, and General Freight Agent Utt had backed his chair up in a corner so that he could not be hurled to the floor. President Ives sat in his chair in the middle of the floor, his feet well spread out, so as to guard against the sudden and terrific jolts, his hands grasping the sides of the chair, his teeth set and his face pale. He was riding about twenty miles an hour faster than he wanted to, but he wouldn't own up, and he was prepared to die rather than acknowledge by any sign or word that it wasn't the smoothest roadbed he had ever ridden over.

In the meantime, the car rolled from side to side, jumped clear of the track, and then settled down again as though it was going right through to China. It was wonderful how it ever kept the rails, but it did.

When the train began drawing near Boone River, everybody drew a sigh of relief, thinking Funk would surely slow up for the bridge. But he didn't. In fact, he seemed to give the lever an extra notch or two, and all of a sudden, the bend and the bridge were struck. There was a fearful jar that seemed to tear the car apart. President Ives keeled over in his chair and landed on Passenger Agent Hannegan. General Freight Agent Utt, who was thrown into a corner, lay still and drew on the resources of a choice and rich vocabulary of profanity. Chief Engineer White and Charlie Ives were almost inextricably mixed up, but the Chief Engineer was the first man to unravel himself, and, grabbing for the bell-cord, pulled it like a man who has come home from the club at 2 A. M., and finds the door-bell won't respond.

"I'll bet that bridge has been knocked two feet out of line," shouted the excited engineer.

The rest of the party scoffed at the idea.

"Well, then let's run back and see," said the Chief Engineer. "I tell you that bridge is at least two feet out of plumb, and I'll bet the month's salary on it."

The train was brought to a standstill and then ran back to the bridge. Reaching there the whole party disembarked and the engineer produced a foot rule. The bridge had been moved bodily by the force of the blow—not so much as Mr. White had said, but by a good seven inches, as was proved by actual measurement. Nobody pretends to say how fast that train was run, but everybody on board is willing to swear the record has never been broken, and the time made was faster than President Ives ever wants to travel again.

A vessel arrived at San Francisco recently with a cargo of 1,450 tons of coal from Coal Bay, Cook's Inlet, Alaska, the first cargo of any size ever brought from that Territory. There is said to be a plentiful supply of coal in those Arctic regions, but it is only of late that it was developed. It is a very important thing for Calfornia, which is poorly supplied with coal, and the largest supplies come from foreign sources at present. A plentiful supply from American soil, with no duty to pay, will have an important bearing on industrial affairs throughout the State.

What becomes of all the ships? According to Lloyds', last year 68 vessels, comprising 49,100 tons, sailed from some port or other and were not heard from again. Of the total thus passing out of record 28,500 tons were British. A London paper says that it may be accepted as a testimony in favor of steel that of the total tonnage lost only 12 per cent. was constructed of this metal, while 41 per cent. was of iron and 47 per cent. was wood and composite vessels.

Molasses as a Fuel.

The low price of common molasses some year or more ago suggested its use as fuel, and the suggestion attracted wide attention at the time, and several inventors had in hand apparatus that they believed would be successful in burning molasses if it were to be used as fuel.

Molasses is now as low or lower than ever, two cents per gallon hardly being obtainable for it. Of heavy bodied molasses 166⅔ gallons will weigh a short ton of 2,000 pounds. This would make full cost $3.33 per ton on the plantations and rather less per ton than current prices for coal delivered there.

The question would then arise as to the fuel value of molasses. As it is almost altogether carbonaceous matter, it must have a considerable fuel value, but its relative merits as compared with bituminous coal we have no data at hand to determine. Heavy-bodied common Louisiana molasses contains say 20 per cent. water, 8 per cent. ash, 12 per cent. gums and 60 per cent. sucrose and glucose. Hence we have 72 per cent. of carbonaceous matter available as fuel and only 20 per cent. of water. This would certainly make excellent fuel if there were competent devices to burn it, such as are used for liquid fuels.

Molasses has recently been used for fuel in Cuba and with seeming success. It was there poured or sprayed on to the bagasse as it entered the furnace, and the judgments of those interested was that its efficiency as fuel when used in this way was incontestible.

The molasses product of Louisiana for 1892 will probably reach 120,000 tons, and if of equal value with coal it would represent 120 boatloads of 10,000 barrels each. Most of it is yet too valuable to use as fuel, but the constant tendency of our molasses is toward low grades, and year by year less of it is consumed as food. We need new outlets for it, and its possible use as fuel promises relief.—*The Louisiana Planter*.

New Pullman sleeping cars which are being built for the Union Pacific will be illuminated with Pintsch gas. The oil lighting equipment of the cars running over the Union Pacific lines is being taken out, and Pintsch gas equipment supplied in its place.

Plans have been forwarded for the construction of a Pintsch gas plant at Oakland, Cal., and arrangements are being made for the erection of another plant at Portland.

The Switchmen's National Convention, at Dallas, Tex., reports that 82 lodges were organized the past year. It claimed that unless Congress passes a law establishing a standard height for freight cars it will be impossible to make an automatic car coupler work successfully.

The Southern & Southwestern Railway Club.

This Club met in the parlors of the Kimball House in Atlanta, Ga., Aug. 18. President R. D. Wade occupied the chair, and twenty-five members were present.

The report on "Repair Work on Large Systems and Location of Plants for Same" was deferred on account of the unavoidable absence of Mr. Leeds, and illness of Mr. W. H. Thomas. On motion the committee was continued.

Mr. Gibbs stated that the committee on "Performance Sheet" had not met yet.

President Wade stated that the great multiplicity of conditions of operations rendered a uniform performance sheet almost impossible, and on motion the committee was dismissed.

The subject of "Joint Inspection" was then taken up and discussed at considerable length. Mr. R. P. C. Sanderson, Superintendent M. P., Norfolk & Western, forwarded a communication on wear from packing in cylinders.

LOCOMOTIVE CYLINDERS.

The Norfolk & Western Railroad has been using 20-inch cylinders since 1884. Several styles of spring and sectional packing were at first used, but were found very expensive to maintain, although efficient enough. We then tried steam packing, which we found wore cylinders too much. Finally we settled down to the ordinary cast iron rings, expanded by their own elasticity.

It was some time before we adopted the present dimensions of the ring. We first used 1 inch by 1 inch section, which was recommended to us as being good practice on some Northern roads, but we found the ring too stiff, especially at the points. Since then we have gradually altered the section to 1 inch by ¾-inch for 20-inch cylinder, and turned the ring ⅛ inch larger than the diameter of the cylinder. We have used backing pieces at the joints of various patterns, but these all proved unsatisfactory, as they will break and get behind the rings, causing the rings to break.

The simplest, and I believe the best, plan is to half-lap the joints and use no backing pieces whatever. One reason, I believe, for this is that riveting a backing-pin on to the ends stiffens the points of the rings and prevents them being as flexible as they should be, and if not riveted they soon give trouble. We have also abandoned the use of follower plates and follower plate bolts on pistons. We found it impossible to keep the follower bolts from working loose and knocking out cylinder heads, and we find our running repairs are reduced by using the solid pistons, so we spring in the rings, although it is a little inconvenient to replace them when broken.

Recently we have fitted up some trial pistons with rings bored eccentrically, so that the elasticity will be the same at the point as at all other parts of the ring. We hope this will show an increased mileage as well as a decreased wear on cylinder.

Criticism of "Railway Car Construction."

The following is an abstract from a very complete review of "Railway Car Construction," by William Voss, that appeared in a recent issue of "The Railroad and Engineering Journal":

In this preface the author of this book says, very truly, that "we have books on all conceivable subjects, but absolutely nothing, except the reports and Dictionary of the Master Car-Builders' Association, on the subject under consideration." Considering the enormous interests involved in car construction it is remarkable that there has been no treatise in any language on that subject until the appearance of the one which is the subject of this notice. The author, therefore, had an inviting field, and an opportunity seldom offered to a maker of a book. He was induced, he says, when in charge of the car department of a Western railroad a few years ago, to write a series of articles on the construction of cars for publication in THE NATIONAL CAR AND LOCOMOTIVE BUILDER. He disclaims having any literary training to qualify him for the work, and says he engaged in the enterprise much against his inclination. The railroad public may be congratulated on the fact that his disinclination to undertaking the work was overcome, and that he has given it the volume before us.

While the author's want of training and experience, as a maker of books, is indicated in many places, no lack of practical skill or experience, which is of very much more importance in writing such a book, is anywhere apparent.

The book measures 8 x 10 1-2 in., and contains 177 pages and about the same number of engravings. These are nearly all outline illustrations of the details of cars, made by the "wax process," which leaves nothing to be desired in their execution.

The descriptions and the observations all through the book are those of a practical car-builder, accustomed daily to meet the difficulties of construction and repair. He has troubled himself very little with theories or general principles of any kind. A car has presented itself to him as a structure not built in accordance with any particular theory or on any general principles, but to fulfill certain practical requirements of service and endurance. The defects of construction have revealed themselves to him in their demands for repairs, and until these have manifested themselves in that way he has not bothered himself much about theories of any kind.

Now there can be no doubt that if the general principles of car construction had been adequately discussed, the value of the book would have been much increased; but if we were compelled to choose between a book without any of the science of construction and an abundance of practical knowledge, like the one before us, and another giving all the science and none of the experience of a car-builder, we, and probably most railroad men, would prefer the former.

The general comment on the book is that, while it does not fulfill the demands of a comprehensive treatise on the subject, it is nevertheless a valuable contribution to its literature, and one which will be found generally useful to practical men.

For "two thousand car-loads of cats gone East," as stated in our last week's issue, please read oats instead of cats.—*Illinois paper.*

Meneely Tubular Bearings.

The following figures give the result of some recent tests made on the Delaware & Hudson Canal Company's road, Sept. 14 and 17, with trains of four cars, each train weighing 102 tons, and each train being hauled by the same engine:

Coal Test.

Brass Bearings. Consumption in running 18 round trips (270 miles).	14,800 lbs.
Tubular Bearings. Consumption in running 18 round trips (270 miles).	11,100 lbs.
Excess of consumption with brass bearings—33⅓%.....	3,700 lbs.

Dynamometer Test.

Brass Bearings. Power required to star. train	3,276 lbs.
Tubular Bearings, " " " "	252 lbs.
Ratio of required power, 13 to 1.	

Gravity Test.

Brass Bearings. Distance run from foot of grade.....	100 feet.
Tubular Bearings. " " " "	534 feet.

The tests were conducted with great care, the effort being with both trains to keep the consumption of coal down to the requirements of the service. As the trials were made with an anthracite burning engine, which, as is well known, is not so responsive to regulation as a soft coal burner, the savings were not made by a reduction of steam pressure, but by the use of shorter cut-offs, the 4-inch and 6-inch notches admitting sufficient steam for the train with tubular bearings, while the 8-inch and 10-inch notches were necessary for the train with brass bearings. The manufacturers of the tubular bearing-claim that they have every reason to believe that the result would have been several points more in favor of their bearings had a soft coal burner been available. An examination of car 136, in service over 21 months, showed absolutely no wear whatever on either journals or bearings. The oil savings of these bearings are fully 90 per cent. of the amount used with brasses.

The International Railway Congress at St. Petersburg was formally closed on Wednesday, the last day of August, and it was unanimously agreed to meet in London in 1895.

Another road is to be built in Florida and a charter for it has been secured by parties in Jacksonville. It will be known as the Southwestern and will extend from Green Cove Springs to Micanopy, 50 miles. The capital stock is $170,000.

The Pennsylvania is credited with having the largest time table of any road in the country. Two hundred and fifty trains enter the Broad Street, Philadelphia, station daily, Sundays excepted, and 225 depart from it. The train service at the New York end is nearly as large.

The Manhattan Elevated reports its gross earnings at $10,695,978, and its operating expenses at $5,425,348, leaving its net earnings at $5,270,000. To this it adds the sum of $140,000 received from the sales of advertising privileges. For rentals and taxes it paid $2,414,917 and declared a dividend of six per cent., a total of $1,800,000. Its surplus at the end of the year is $1,195,712.

The workmen in the deepest mines of Europe swelter in almost intolerable heat, and yet they never penetrate over .007 part of the distance from the surface to the center of the earth. In the lower levels of some of the Comstock mines the men fought scalding water, and could labor only three or four hours at a time until the Sutro tunnel pierced the mines and drew off some of the terrible heat, which had stood at 120 degrees. The deepest bore-hole in the world is at Schladebach, near Kethan, Germany. It is 5,735 feet in depth, and is for geological research only.

Information from Paris says that the liquidator of the Panama Canal Company has concluded an agreement with M. Hielard, the Vice-President of the Paris Chamber of Commerce, providing for the formation of a new company with a capital of $30,000,000 to resume work on the Panama Canal. Work will be resumed immediately in order to prevent the lapsing of the concession granted to the old company by the Government of Colombia. Operations will be concentrated at two points, Culebra and Rio Chagres. When nearly the whole capital has been employed 45 of the 70 kilometres of the canal will be open.

A very interesting exhibit in the Transportation department of the World's Fair will be made by the steamship and railway companies of England. The collection of models of battle-ships, yachts, cruisers, steamers and merchant vessels will be more complete than was ever before exhibited. The London & Northwestern Railway will send over a complete train of cars headed by the locomotive "Greater Britain." This will afford an opportunity to compare the English compartment cars and sleepers with American coaches. The Great Western Railway will exhibit the antiquated locomotive "Lord of the Isles," one of the first used on that road. Several of the railways will show their signaling systems.

Through a Shower of Lead.

It was when Gen. J. E. B. Stuart, commanding the cavalry of General Lee's army, struck Tunstall station, on the York River line, on June 13, 1862, that an engineer, whose name has not been preserved with the record of his daring deed, proved himself to be of such stuff as heroes are made.

General Stuart conceived the idea of flanking the right wing of the Federal army. In carrying out this plan he completely encircled the army of General McClellan. On the afternoon of June 12 he left camp, ostensibly to go to northern Virginia, but really on his flanking movement. The next day he descended upon Tunstall's station and cut the telegraph wire in order to interrupt Federal communication. While this was in progress a small body of Federal cavalry appeared, but perceiving the approach of the main Confederate force retreated. The Confederates charged the station and captured a company of infantry. Then they felled trees and placed them on the track with other obstructions. This was scarcely done when a train came thundering down from the direction of Richmond loaded with Union troops. Then it was that the engineer proved himself the possessor of a cool head and a stout heart. Seeing the obstructions on the track and a large force of Confederate cavalry, he suspected danger, and, disregarding the flying bullets that whistled around his head, he put on a full head of steam. The engine struck the obstructions, knocked them out of the way and passed on without accident, thus saving from capture and consignment to rebel prisons a train load of Union soldiers. The Confederates threw a close fire into the passing train, killing and wounding a number of the troops.

The Chicago, Milwaukee & St. Paul road has been quite successful during the past year in its undertaking to run its own sleeping cars, according to the annual report just issued. The year covered by the report is the first full year of operation by this company of its sleeping car lines. The gross earnings were $196,066.32; operating expenses, $82,546.52, and net earnings, $113,519.80. The investment of this company in its sleeping cars stands on its books at $678,965.13 for 52 cars. It will appear, therefore, that the net earnings are sufficient to pay for the new cars required each year to replace old cars, and pay a fair return on the investment. The result is specially gratifying, because it has not been obtained by impairing the service, which has been satisfactory to the public.

During the year $1,567,740 was expended on new equipments. The payments of this company for labor directly employed in its service during the past year were $13,257,797.99, and for material and supplies $7,595,471.11.

The extensive equipment of new locomotives for the Southern Pacific Railway will much facilitate the handling of the traffic. Of thirty engines built by the Schenectady Locomotive Works twenty are twelve-wheel two-cylinder compounds for freight traffic on the Sacramento division, from Sacramento to Truckee, and the others are ten-wheel engines for the passenger service between San Francisco and Lathrop and Sacramento. The passenger engines now in use on the Western Division are too light for this service, and it has been necessary to run the overland trains from Oakland to Sacramento and Lathrop in two sections, but the new engines are intended to do away with this arrangement, which has caused considerable trouble. On the Sacramento or mountain division the freight traffic is very heavy, but the engines are not able to handle more than twelve or fifteen cars, and thus a great many trains are necessary. Under the present system, two engines are always used on trains, whether heavy or light, but the new engines will obviate this necessity.

The sixth annual report of the Denver & Rio Grande has been issued. President E. T. Jeffery, in his annual report, says: "The income from all sources during the fiscal year ended June 30, 1892, including $63,550.02 received for interest, was $8,894,496.59, an increase of $25,128.92, when compared with the previous fiscal year. The gross earnings from the operation of the railroad were $8,830,946.57, being a decrease of $19,973.77. The working expenses were $5,121,593.37, being a decrease of $388,710.09—or, if the $33,430.97 for 'delayed accounts chargeable to the operations of the previous year' be included, a decrease of $422,141.06—making the net earnings from traffic $3,709,353.20, or $368,736.32 in excess of the previous year. The balance to credit of income from the year's operations, after providing for taxes, insurance, interest on funded and unfunded debt, and assigning $240,000 to betterments and renewal fund, was $914,111.94, which was applied to pay the floating indebtedness.

"The completion last December of the Rio Grande Southern Railroad between Durango and Ridgway (a station on the Ouray branch), a distance of 162 miles, with its branch to Telluride, 10 miles, has afforded direct communication by rail with productive portions of southwestern Colorado heretofore inaccessible except by trail and wagon road. It is confidently believed that much additional traffic and revenue will in time inure to the company from the development of the territory referred to, which is rich in mineral resources and capable of supporting a large population."

The Kinsman Block Sys em.

Train wrecks in consequence of even properly displayed warning signals being passed unobserved by engineers have been so frequent and disastrous that the importance has often been urged of employing some other means than those depending upon vision for warning or for acting to stop the train, where safety demands, independently of the engineer. The apparatus illustrated herewith and known as the Kinsman block system is designed with this end in view, namely, the stopping of a locomotive or train at any prearranged point without the intervention of the engineer. The drawings of the device are so complete that little explanation is needed. In its operation it closes the throttle without moving the throttle lever, and at the same time applies the air brakes. The apparatus is entirely automatic, and gives no signal to the engineer beyond the incidental ones of shutting off his engine and applying the air brakes.

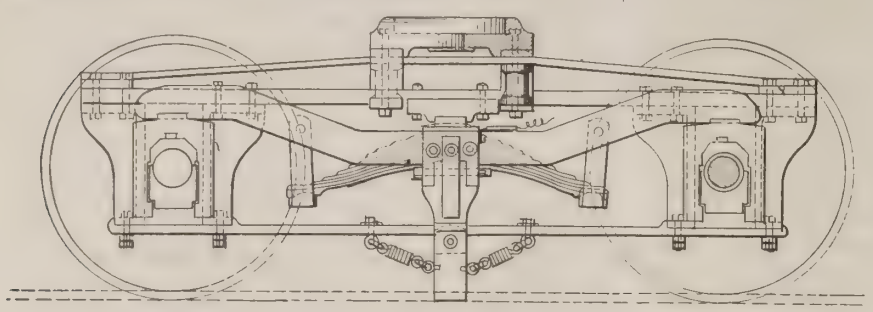


FIG. 1.

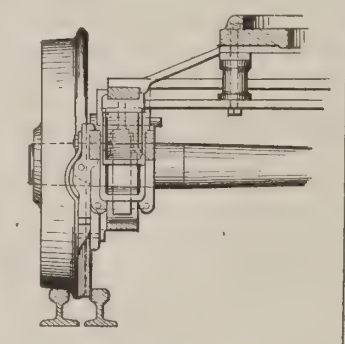


FIG. 2.

The operation of the system is as follows: The setting of a visual signal at danger causes an electric current to enter a rail which is fastened like an ordinary guard rail parallel with the main track, and the usual distance from it, 1⅞ inches on the side opposite the signal post. An arm for making a rubbing connection with this electrical rail is fixed to the equalizer of the engine truck, and follows in the flange way. See Figs. 1 and 2. Through this connection the current of electricity is conducted by suitably arranged wires to an electromagnet in the cab, whose armature, when drawn up, permits a spring to operate in opening a valve in a pipe connection with the train pipe. Figs. 3 and 4 show an arrangement of a throttle valve, lever, etc., and the apparatus in the cab for automatically closing the throttle and applying the brakes. There are two throttle stems, one within the other, the outer one connecting with the bell crank operating the throttle valve, and the inner one connecting with the throttle lever. To the outer stem is attached a piston which is contained within a cylinder as shown. Within the piston are four springs, also shown, which act to hold the inner and outer throttle stems together during ordinary handling. When the apparatus is put in operation by the electrical connection described, while the engine is running and using steam, the armature of the electromagnet in the cab is raised, allowing of the opening of the valve in air brake pipe connection, and the flow of compressed air to the cylinder surrounding the throttle stem and its piston attachment. The air pressure against the piston overcomes the grasp of the springs holding the inner and outer throttle stems together, and by forcing the piston forward closes the throttle valve without altering the position of the throttle lever. A port is placed in the upper part of the cylinder about midway, as shown in the drawings, and when this port is uncovered by the piston being forced past it egress is given to the air from the train pipe, and the brakes are of course applied. In this manner the system acts to automatically close the throttle and set the brakes.

The size of the port opening in the cylinder is adjustable, and in its automatic opening is such as to cause but a service application of the brakes, but it can be enlarged so as to cause an emergency application by the engineer pressing with his foot a light lever conveniently placed for that purpose.

When the apparatus has acted to close the throttle and apply the brakes the engineer can immediately release the latter and resume the use of steam by simply pushing the throttle lever forward and pulling it back again, during which action the springs within the piston will reengage the inner and outer throttle stems and the normal conditions be re-established.

It is not the design of the company that this system shall supplant the various systems of visual signals, but simply that it shall supplement them. It is worthy of special notice that the metallic arm extending from the engine truck equalizer, for the purpose of establishing connection with the electrical rail, rides wholly within the flange way of the wheels, and so is not exposed to obstructions any more than the wheels are.

Another feature of improvement in the system over any other known construction is the fact that there is nothing movable on the roadbed, nor any delicate mechanical movements or apparatus located along the side of the track, which come under the head of trigger or tripping devices. The well known fact that cars and locomotives vary in their dimensions, and their relative relation to objects which they pass along the road, makes such devices impracticable. The swaying of the locomotive under certain conditions of the track or variations of speed, or the listing of cars on account of their being unevenly loaded, makes the utility of such devices exceedingly doubtful. Movable apparatus in position to be operated upon by the passage of a car or engine truck must of necessity be within the reach of persons and conditions which vary in importance according to the season of the year, and the disposition of the passers-by. It is plain that the apparatus in the cab is of a simple and substantial character, and not likely to add much to the cost of repairs, while it does not interfere with the ordinary manipulation of the throttle.

The offices of the company are at 143 Liberty Street, New York.

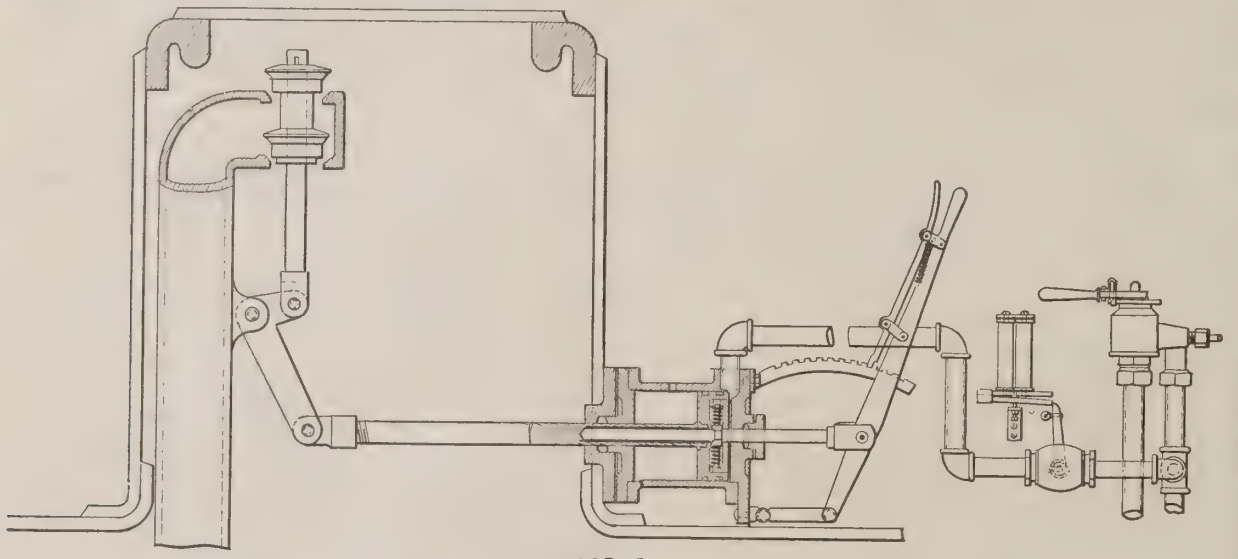


FIG. 3.

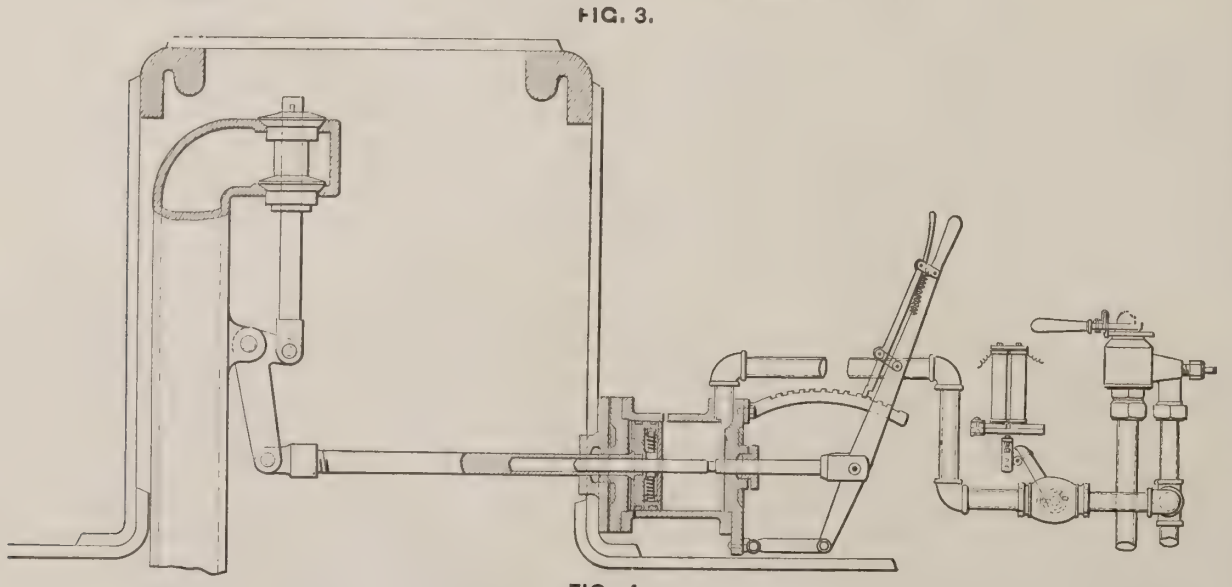


FIG. 4.

More Furniture Cars Wanted.

The demand for larger cars among furniture shippers still continues, and there is a loud call for them among manufacturers in both the East and West. Indiana claims to use more of these cars than any other State in the Union, and besides the convenience which they afford to furniture men and carriage builders the Westerners make the point that they are also more economical for the railroads, as they are eagerly sought by shippers of hay, wool and cotton. It is also urged by the manufacturers that the minimum of a carload of furniture is 12,000 pounds, and it is difficult to get that weight of furniture into an ordinary car. If the roads would reduce the minimum to 10,000 pounds there would be more of them desired at a proportionate charge.

The Cincinnati, Hamilton & Dayton Railroad have 100 of these "elevator" cars, and find no difficulty in loading them as fast as they can be furnished. There is no ground for doubt that if the railroads would furnish these large cars when requested furniture manufacturers would appreciate the movement and recompense the roads for the outlay required to build more of them. —*Furniture Trade Review*

It is reported that the Rio Grande Western Company is to build new car and machine shops that will give employment to about upward of 1,000 men at Ogden, Utah.

The railroads running into Mexico from the United States have been doing a largely increased business since July 1, when the Mexican government removed the duties from grain.

A corporation known as the Aumatic Refrigerator Company has been organized at Portland, Me., to manufacture railroad appliances and rolling stock, and has a capital of $250,000.

Ticket collectors are to be put on all the passenger trains of the Missouri Pacific road, in consequence of the alleged discovery of a systematic plan of stealing that is being carried on by the conductors.

It has been decided to build an extension of the Indiana, Illinois & Iowa Railway, from Knox, eastward, to South Bend, Ind. The preliminary survey has already been made, and work on the extension will soon begin.

In one respect Quito, the capital of Eucador, is the most unique city in the world—it is situated in both the northern and the southern hemispheres, a distinction claimed by no other place of importance on the globe. At Quito the sun rises and sets at 6 o'clock the year around. In one part of the city the summer season does battle with old winter, who is just across the street. The seasons, as far as names are concerned, change almost instantly; but, as the temperature is remarkably even, these curious points are seldom thought of or commented on by the inhabitants.

The Central Railroad of New Jersey has abandoned its old passenger station at Elizabeth, N. J., after an occupancy of 37 years and moved into a new and beautiful stone and brick structure near by. It took the men just one day to demolish the portion of the old station belonging to the Central company, and the other portion, used by the Pennsylvania company, is now down. The latter company has built a temporary station near West Grand Street, pending the erection of one of the finest stations in the State at East Broad Street.

There has been a very noticeable falling off in the trade between Great Britain and Brazil, says *Engineering*, since the reciprocity arrangement between the latter country and the United States went into effect. The following statement shows the value of the exports of 18 chief articles of merchandise during the first five months of the calendar year, 1892, compared with the corresponding period of the previous year:

Classes.	1891.	1892.	Decrease.
Coal, coke, cinders and fuel	$1,102,316	$822,633	$279,683
Cotton piece goods	4,546,323	4,312,902	233,421
Linen	255,340	134,121	121,219
Woolen and worsted fabrics	849,359	712,986	136,373
Copper manufactures	136,111	118,212	17,899
Hardware and cutlery	366,637	275,687	90,950
Iron manufactures:			
Railroad	265,326	128,510	146,816
All other	1,211,788	908,702	303,086
Machinery and millwork	2,197,415	1,604,178	593,237
Cement	122,470	58,890	63,580
Earthen and chinaware	161,042	114,494	46,548
Seed oil	106,907	101,379	5,528
Total	$11,321,034	$9,292,694	$2,028,340

Boiler Scale and Purification of Feed Water.*

BY F. A. STINARD.

Nearly all natural waters contain more or less of scale-forming elements, being not only held in solution, but suspension also. The amount of mineral matter held in solution by water ordinarily supplied for boiler purposes varies from 10 to 150 grains per gallon, and in some localities even more than this has been found. But a much less quantity than the latter is sufficient to cause trouble and expense. Deep well waters contain more than surface waters, and it is generally supposed that rain water as it descends from the clouds is pure. No doubt this is true, as far as the mineral elements are concerned; but after it reaches the earth and passes through it it takes up and holds in solution elements that change its condition, and those elements are, generally speaking, composed of the carbonates of lime and magnesia, and, in some cases, chloride of sodium (common salt). Well or mine waters contain more of these incrusting solids than surface water or water that is used from streams or rivers. In some instances water has been used for steam boilers that contained as much as 200 grains per gallon.

It has been stated that as much as 1,800 pounds of incrustation have been taken from a single boiler at one time. It would seem as though it were almost impossible for so large a quantity of earthy matter to be deposited from waters which average only 17 grains per gallon. When we come to think, however, of the vast quantities of water that pass into a locomotive boiler, in some instances about 45 gallons per mile, we would have, if we accept the above statement, on an average of 765 grains, or more than an ounce and a half of earthy matter which enters the boiler per mile; multiply this by 4,500, the average number of miles run by a locomotive per month, at the present time, we would have a little over 420 pounds of incrustating matter entering the boiler in one month, or over 5,000 pounds per year. This amount of solid matter is sufficient to cover 400 square feet of surface three-quarters of an inch thick. Nor is this the maximum; some locomotives take water at stations that furnish water that is much below this average in purity.

The effect of such incrustations or deposits are detrimental, and add largely to the running expenses both for fuel and repairs, as well as great risk of explosions, and shortening not only the life of the flues, but the boiler as well. There is no doubt but what a coating of scale increases very much the difficulty of heating the water. Scale deposits, whether hard or crystalline, or soft and slushy, are very poor conductors of heat, being relatively as to iron as 1 to 32, so that $\frac{1}{32}$ of an inch of scale is almost equivalent to an inch of iron interposed between the heat of the fire and the water. Various estimates have been made as to the proportionate loss in fuel from scale. It has been generally accepted that $\frac{1}{8}$ of an inch of scale causes a loss of 28 per cent., $\frac{1}{4}$ of an inch 60 per cent. and $\frac{1}{2}$ an inch about 150 per cent., or $2\frac{1}{2}$ times the fuel required if the boiler was clean.

As to repairs, when a boiler is coated with scale the heat conducting power between the fire and water is in a proportion rapidly decreasing with each successive film of scale on the iron, so that in order to raise steam to 90 pounds pressure, corresponding to a temperature of 320 degrees Fahrenheit, in a boiler with quarter-inch iron in which there is a layer or scale or deposit one-half inch thick it would be necessary to impart about 800 degrees of heat to the iron, whereas if the iron was clean 325 degrees of heat would produce 320 degrees in the water. Iron heated to 800 degrees, which is equivalent to dull redness, is very weak, and is just in condition when bulges and cracks occur, and if nothing more happens immediate repairs are necessary. A properly designed and well constructed boiler, when equal to the work required of it and intelligently cared for, should last in good condition from 15 to 20 years; but how many boilers are there that continue in good condition for even five years? In most cases the depreciation of boilers is caused from the giving out of the fire-sheets until they have been patched past redemption. This trouble with firebox sheets is entirely owing to deposits of sediments and scale, which, although most affecting the fire-sheets, weaken the whole boiler. A much patched boiler is positive indication that it has suffered from undue and unequal expansion and contraction.

With a view of counteracting the injurious effects of deposits contained in water used in steam boilers we will look at their composition and action while in the boiler. From the tables of analysis, both of water and incrustations or deposits in steam boilers, it is found that the main ingredient that causes the trouble is carbonate and sulphate of lime and magnesia, and in salt or brackish water chloride of sodium or common salt. The carbonates of lime and magnesia alone do not form a hard scale, in fact would not form a scale at all except when baked on the hard surface of iron by removal of water, as, for instance, blowing out a boiler with steam on, something which ought never to be done. If the boiler is allowed to cool, the carbonates will be found in the bottom, after settling, as soft, slushy mud of various shades of brownish gray; in this condition they may be easily washed out of the boiler. While the boiler is steaming the carbonates, which are quite light and of impalpable fineness, are agitated and kept in motion by the currents in the boiler, and are constantly thrown to the surface until they find a quiet place in the boiler, removed from heat, where they can settle; but when the boiler is allowed to cool down for awhile they become precipitated on all the heating surfaces where the heat bakes them into a more or less hard crust, according to their purity. The sulphates of lime and salt at first act a good deal like the carbonates, as on separation from the water they appear as fine impalpable powders, which are agitated by the currents and thrown to the surface; but as they are much heavier than the carbonates they settle more easily, and attach themselves to the heating surfaces as hard and crystalline white scale, which can only be removed by hand-chipping. In examining incrustation taken from a boiler it is frequently found that they show a succession of layers of various degrees of color and hardness. In such cases the light colored hard layers are sulphate of lime, and the soft chalky layers are mostly carbonates of lime and magnesia.

Among the various contrivances in use at various times to prevent the accumulation of these deposits and incrustations those most generally used were mud drums, bottom and surface blow-offs, heating the feed-water, chemical compounds and filtration or purification of the water before entering the boiler. In some cases some of these would result beneficially, especially the last, and it would seem as though the purifying the water of these scale-forming elements before it is used was the better and more common-sense way of solving this question, and thereby save a large amount of subsequent expense for labor and repairs, and not only that, it would insure a longer lease of life to the boiler. The mud drum is in no sense an extractor of either mud or sediment; the position it generally occupies makes it impossible that its contents should ever become sufficiently heated to effect a separation of the salts held in solution. It may collect matter held in suspension, where muddy feed water is used, but a simple filter would be more effective. The objection to surface blow-offs is that, in order to be effectual, their use must be frequent, thereby wasting water already heated, and at the same time increasing the duties of the engineer and fireman, which leads to a gradual neglect of the means at hand. Feed-water heaters are frequently called "lime-catchers," but the justice of that claim is questionable. In order to effect a complete separation of the salts in solution the water must be heated considerably above the boiling point, and, in addition, time and quiet must be given for precipitation to take place, so that even in heaters, which heat feed-water to the boiling point, only a small proportion of the lime can be extracted, owing to agitation in the heaters from the currents and the lightness of the carbonates of lime which need considerable time for precipitation. Feed-water heaters are, no doubt, beneficial and good results in the saving of fuel are obtained. Chemical compounds variously known as anti-incrustators and lime extractors act variously according to their composition when put into a boiler. But they in no case extract or remove sediment or deposits from a boiler. The most that can be said of them is that they rot or loosen old scale in the boilers so that it can be easily removed by the hand or by converting the sulphate of lime or other hard incrusting elements into a slushy condition so that they can readily be removed by washing out.

Taking all the foregoing into consideration it would seem that instead of pumping water into a boiler that is impregnated with these scale forming elements and fighting them in the boiler, if we would purify the water of these incrusting solids before it is taken into the boiler we would be taking a step in the right direction, and our boilers would last longer. Now the question arises, Can this be done economically and effectively? For answer we would say that in 1844 the late Dr. Clark, of Aberdeen, Scotland, brought out his process by adding just sufficient slaked lime to the water to combine with the free carbonic acid, and thereby causing all these carbonates to precipitate at normal temperature. By using this process in a suitable plant we can dispose of these salts and get the water clear of them at normal temperature, and flush away the sediment as it accumulates. A plant of this kind, using the above process, has been in use upon the Union Pacific Railway for the past year, giving satisfactory results, so much so that other plants are being put in at other points, the company feeling satisfied that a large saving can be effected.

A description of this plant is as follows: A small closed tank of boiler-iron is placed in some convenient location, by the side of the feed or water supply pipe, with an inlet pipe from and a discharge pipe into the feed pipe on either side of a check-valve, by partially closing which a portion of the water is compelled to pass through the closed or chemical tank. The gate-valve is then closed, the inlet and outlet valves opened, the feed-pipe and check-valve partially closed, and the charged water is gradually carried into a large water-tank. In the water-tank the feed-pipe discharges the water through an elbow, delivering the water horizontally, close to the side of the tank, about one quarter the depth from the bottom, imparting to it a whirling motion, whereby the precipitate or sediment is gradually deposited at the center of the floor of the tank, the clean water rising to the surface, and the water drawn off for use, by a suitable device. A valve is placed in the center of the bottom of the tank, or as near the center as possible, from which a waste pipe leads away to the nearest ditch. This is opened from time to time, and enough of water is run off to carry away the constantly accumulating sediment. It is needless to dilate on the advantages to be derived by the purification of boiler-water before it is taken into the boiler. Every railroad manager knows to his sorrow what boiler-scale costs.

*Read at the September meeting of the New York Railroad Club.

Patent Axle and Crankpin Lubricator.

We illustrate herewith a recently patented invention designed to provide a simple and improved manner of lubricating journals, which has been invented by Mr. J. T. Connelly, of Milton, Pa.

In the drawings Fig. 1 is a central longitudinal sectional view on one end of a car axle. Fig. 2 is a tranverse sectional view of the line $x\,x$, Fig. 1, looking outwardly. Fig. 3 is a similar view on the line $y\,y$, Fig. 1. Fig. 4 is a detail perspective view of the screw plug. Fig. 5 is a view similar to Fig. 1, illustrating its application to crankpins for slide-rods and other journals. Referring to the drawings, *A* designates one end of a car axle, which is preferably formed with a reduced bearing surface *a*, as usual.

Centrally within the axle end is provided a longitudinal bore *B* extending from the extreme end of the axle to slightly beyond the inner end of the bearing surface *a* and having at its outer portion interior screw-threads *B*. *C* designates a plug for closing the outer portion of the bore *B*, and to this end it has external screw threads *b*. The plug *C* is provided with a central bore *D*, of greatly less diameter than the bore *B*, and extends from end to end of the plug. One or more bores *E* are provided through the journal and at coincident points through the plug, said bores extending from the bore *D* to the periphery of the axle.

The axle being journaled in boxes provided with saturated waste, the oil or other lubricant from the latter enters the bore *B* through the bore *D* and finds an outlet through the bores *E*, a certain quantity of the lubricant being at all times held within the bore *B* (in practice about one-third the capacity of the latter) and serving the office of keeping the journal cool. This result is obtained by reason of the bore *D* being of greatly less diameter than the bore *B*, and communication between the latter and the periphery of the axle being had only through the bore *D*, the lubricant when it reaches the level indicated in dotted lines, Fig. 1, finds no outlet, the remaining quantity being thus permanently retained within the bore *B*.

It will be obvious that this improvement is also applicable to crankpins for sliderods and like journals, as illustrated in Fig. 5. In this instance the outer end of the plug is closed and an oil cup *S* is carried by the bearing for the journal, and has its outlet in a direct transverse plane with

Fig. 1.

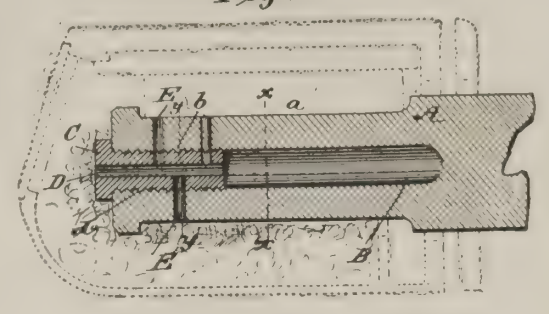


Fig. 2

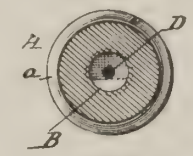


Fig. 4.

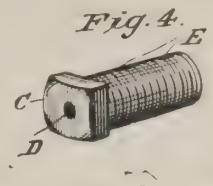
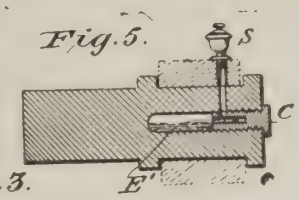


Fig. 5.



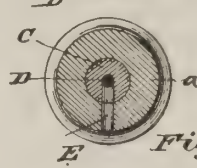


Fig. 3.

the bore *E*. Thus as the journal revolves the latter bore coincides with the outlet of the oil cup and the lubricant passes therefrom to the interior of the journal; but when the bore is removed from the outlet the lubricant is deposited upon the periphery of the journal to lubricate the same.

The Egan Company, of Cincinnati, O., has just issued a handsome catalogue of nearly 300 pages, which displays a large line of most improved mechanisms for the saving of time and labor, which can now be had by those interested on application. The Egan people are building a special line of tools adaptable for car building and car repair work.

The Indiana Car and Foundry Company is now building new cars having increased its capital stock. Mr. J. C. Fortiner, formerly with the United States Rolling Stock Company, is the General Manager, with headquarters at Indianapolis. The other officers of the company are Major Collins, President, Brazil, Ind.; H. S. Chamberlain, Vice-President, Chattanooga, Tenn., and E. Pollak, Secretary and Treasurer, Cincinnati, O. The company has taken an order from the Illinois Central Railroad to build some World's Fair passenger coaches.

The Q & C Company have just issued a neat little pamphlet entitled "The Servis Tie Plate," which is devoted to proclaiming the merits of this channel form of plates as demonstrated by over six years of use on many large railroad systems having heavy and high speed traffic, on tracks and switch sets on some of the busiest yards, tracks on the longest bridges, and the heaviest grades and sharpest curves of the Allegheny and Rocky Mountain roads.

The James Spear Stove and Heating Company, of Philadelphia, Pa., has received more orders this year for their anti-clinker car heater than for several years past. These heaters have been in use in the cars of the leading railways of the country for a number of years past and have always proved satisfactory. This company also manufactures a caboose stove which embraces every feature essential to safety convenience and satisfactory cooking and heating. This stove was illustrated in the NATIONAL CAR AND LOCOMOTIVE BUILDER, December, 1891. Sample stoves will be furnished any road subject to approval.

The Whirlpool Water Purifier Company has been organized in Kansas City for the purpose of handling Mr. Arthur Pennell's U. S. patents for softening and purifying hard water. Mr. Pennell has recently patented a mechanical device for economically utilizing certain well known chemical processes, by which the different salts of lime and magnesia can be eliminated from the water at normal temperatures in the existing railroad tanks. At a temperature of 200 degrees Fahrenheit, moreover, the soda salts, which cause the water when boiling to foam, and also corrode the metal of boilers, can in a great part be disposed of and the remainder rendered harmless. By this device also water that is turbid can be in a short time rendered clear and bright. Two plants have been working for some time and are giving complete satisfaction; so much so that the parties are duplicating their plants. A large quantity of work is in immediate prospect for the company.

The Magnolia Anti-Friction Metal Company, of 74 Cortlandt Street, New York, has recently issued a circular illustrative of the increase in sales of "Magnolia Metal" since it was first put on the market in 1886. From this circular it appears that the sales for the year 1891 were about $22\frac{1}{2}$ times as great as the combined sales for 1886 and 1887; and the sales for 1892, from present indications, will exceed thirty times the business done during years 1886 and 1887. Mechanics, as a rule, are eminently practical, and an article of this kind cannot be juggled into success, but must pass the trying ordeal of practical everyday use. If it possesses unique qualities they will certainly be found out and appreciated; but if the article does not possess value no amount of persuasion can change the opinion thus formed. From the success met by the manufacturers of "Magnolia Metal," as indicated by the large and rapid growth of their business, it is evident that the metal has given remarkably good satisfaction as a reliable and cool running journal bearing alloy.

Progressive Management.

The Consolidated Car Heating Company is probably the first manufacturing firm to put in practice a school for employees to instruct them in the theoretical and practical points of the business. Recently all the employees of this company met together at its new factory, at Albany, N. Y., and spent two days in carrying out a carefully arranged programme which covered a discussion of the theory of hot water and direct steam heating in all its branches, and accompanied by practical illustrations of the working of all apparatus under steam and fire. The fourth floor of the factory of the company was specially built for the purpose of testing and experimenting, and on this floor full size apparatus of all varieties has been put, and was seen in operation. A paper was read by one of the company giving a full description of the construction and operation of the appliances under consideration; then possible errors in equipment which were to be guarded against were pointed out, and following this questions were asked by all present. Advance sheets of the company's new catalogue were submitted, and several new devices which will be put upon the market this season and will be of considerable interest to railroad men generally were exhibited and discussed.

Resolutions of sympathy and condolence with the family of the late James T. Leighton were offered by the Vice-President and seconded by the General Manager and adopted, and a copy of such resolutions directed to be sent to Mr. Leighton's family. Mr. Leighton had been in the service of the Consolidated company since its organization in 1889.

Boiler Pitting Cured by Graphite and Oil.

In a recent issue of the *American Machinist* Mr. T. T. Parker contributes an article regarding pitting in boilers. He says: "In a boiler of the porcupine persuasion pitting was found in the mud drum. Acting under advice, the drum was cleaned and scraped, after which it was painted with graphite mixed with cylinder oil. Measurements of the depths of the pits were taken, and six months after they were found no deeper, and no new ones had shown up. Other parties have since tried this experiment in mud drums, but it is too early as yet to give the result. However, knowing the character of plumbago, if the interior of a boiler could be painted with it in such a way that it would stay, it may be that this would prove a remedy. I am satisfied also that the person doing so would kill two birds with one stone, as the scale could be easily detached. In a pair of cylindrical boilers 42×28 inches occasional applications of cylinder oil (mineral) and plumbago has kept back corrosion on a trial of six months. Boilers were new when plumbago was used. The boilers which the new ones replaced were thrown out rotten from corrosion. The feed was mine water, as nothing else could be had."

Messrs. Harig, Koop & Co., Louisville, Ky., after experiencing more or less trouble from rust and scale in the mud drums of their boilers, applied with great success graphited oil, purchased from the Joseph Dixon Crucible Company Jersey City. The mud drums were cleaned out and the graphited oil applied with swab, brush or anything handy to the joints and parts where the water enters the drums. Every four or six weeks this process is repeated with gratifying results.

Portable Boring Bar.

This machine is adapted for boring out locomotive or stationary cylinders while in position, or the bearings of large or heavy pieces which cannot conveniently be done on stationary machines. The cut and feed is in every case as heavy as can be accomplished on a stationary machine, hence in most cases work is executed with much less expense, more accurate and perfect alignment.

The heads of these bars can be applied to either a traveling bar or a traveling head with any change of feed. The feed can be thrown out of gear while the machine is in motion by operating a lever (not shown in cut). The bar or head can be receded or advanced quickly by power or hand.

A set of change gears is furnished with these boring heads in order that the proper cutting speed of tool can be maintained for different diameters of cylinders or holes.

These bars are accurately ground, bearings are well scraped out to fit and the gears are cut.

They are built in three sizes, the diameter of bars being 2⅝, 3⅛, 5⅛, by James T. Halsey, Twenty-sixth and Callowhill streets, Philadelphia.

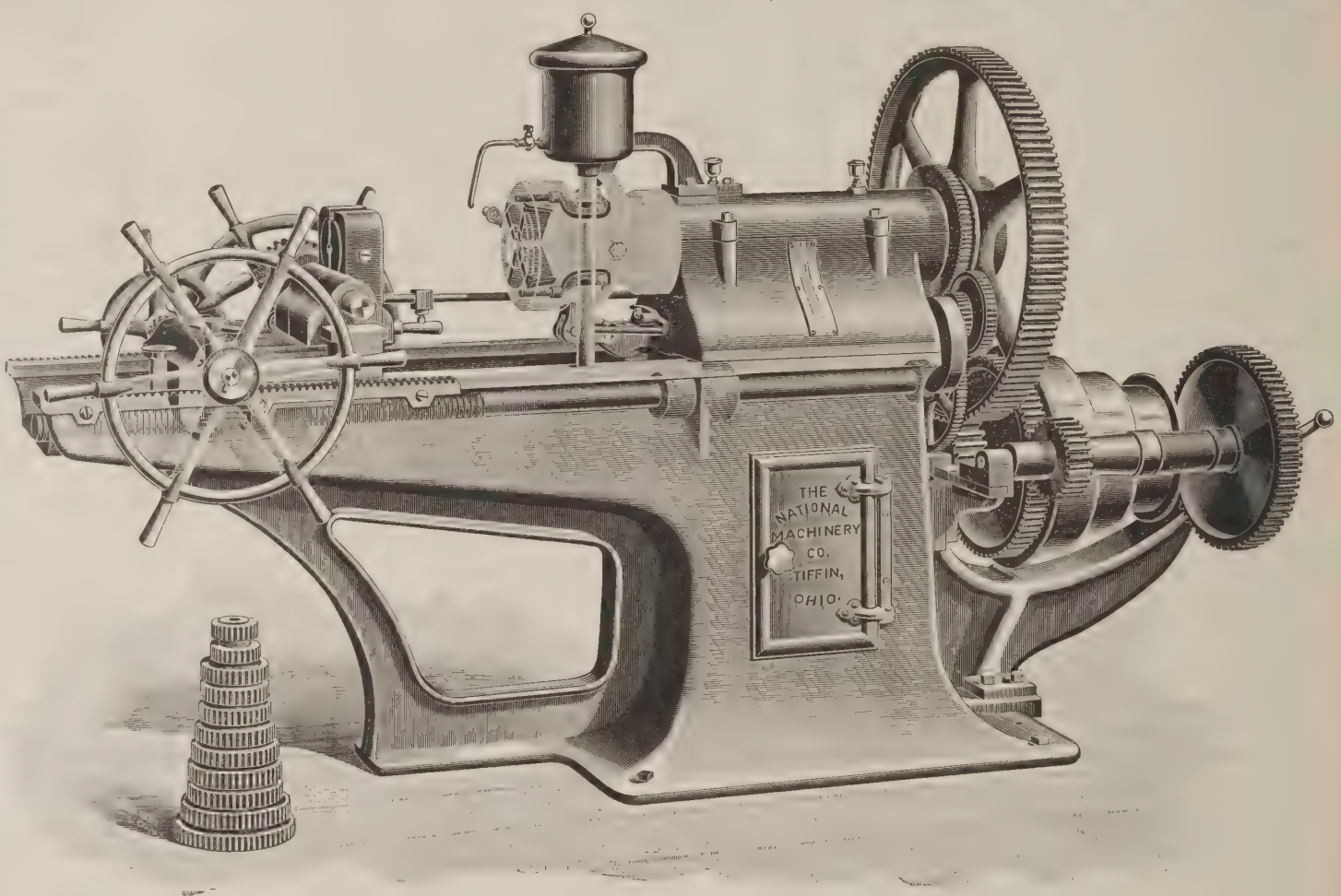
The Illinois Central has ordered of the Wells & French Company 175 special cars for World's Fair passenger traffic and 100 similar cars of the Indiana Car and Foundry Co.

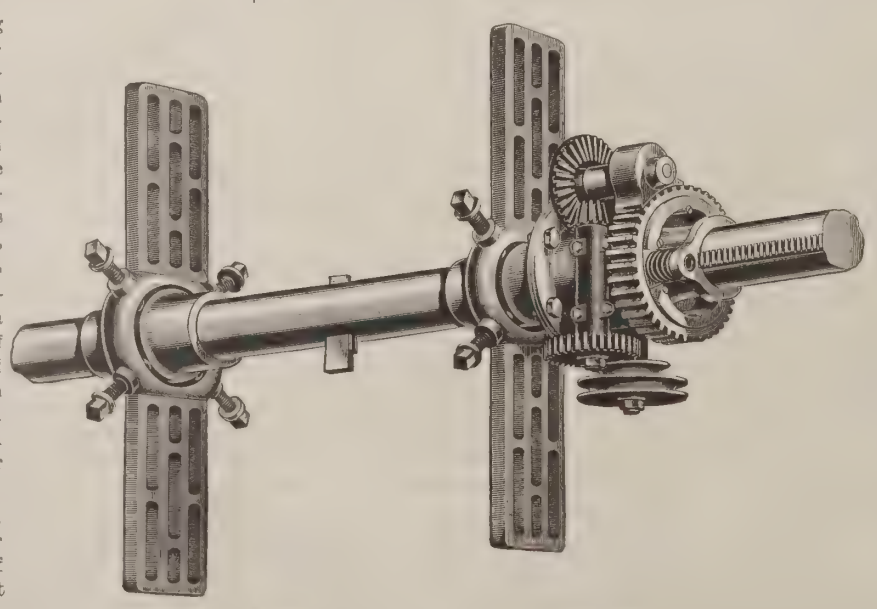
The Billings & Spencer Company say in regard to the past year's business and present outlook: "Our business for the present year has been very satisfactory to us, and in amount has far exceeded that of last year. Our trade in Billings' Patent Commutator Bars, drop forged of either Pure Lake Copper or Tobin Bronze, has been constantly increasing and we are now doing a large business in this line, not only with the electrical companies manufacturing dynamos and motors, but also with the street railway companies direct, who require these goods for repairs. The sales in our machinist's tool department have been very satisfactory and constantly on the increase. In the electrical line our lineman's hand vise, combination pliers and drop forged wrenches are meeting a large demand. We consider the outlook for the coming year to be very promising, and in evidence of same would state that we are at present erecting a new factory, office and shipping department. The total length of buildings will be 208 feet by 40 feet wide, two stories and basement."

National Bolt Cutter with Lead Screw.

We present herewith an illustration of a "National" bolt cutter fitted with a lead screw for feeding the carriage at the proper rate for the bolt to be cut, change gears being provided for the screw, the same as for the lead screw of a lathe.

Where square or bastard threads are cut on a bolt cutter it is found very difficult if not impossible to get satisfactory results without a lead screw, owing to the drag of the die, and the tendency is to increase the pitch of screws cut on bolt cutters and enable parties to cut screws upon them formerly considered fit only for the lathe. A lead screw makes this practicable, and some remarkable jobs of thread cutting are now done in this way, The machine is provided with the latest improvements in the way of automatic and hand opening dies, pumps, etc., and with the "National Case Die." It is made by the National Machinery Company, of Tiffin, O.





Mr. F. W. Johnstone, Superintendent of Motive Power of the Mexican Central Railway, has recently taken out patents for a brick arch for locomotive fireboxes, the purpose of which is to make an arch which is entirely independent of the firebox sheets for support, and with this idea in view a portion of the grate surface in the front of the box is converted into a support for the bricks which form the arch.

The Boyden Brake Company has recently erected at its factory in Baltimore a testing rack for brakes, on which are arranged 100; 50 of which are the latest Westinghouse and 50 of the Boyden. The rack is equipped with all the devices necessary to make the M. C. B. test, and in addition a novel chronograph which registers the different actions of the brakes by tenths of seconds.

The John Dixon Crucible Company, of Jersey City, N.J., has issued a neat little pamphlet descriptive of the comparative lubricating qualities of graphite and the best sperm oil. A view is also given of the Ticonderoga graphite mines belonging to the Dixon Crucible company. These mines are said to be the only mines in the world from which an absolutely uniform flake graphite can be obtained; and the flake is the proper and only form of graphite which insures perfect lubrication.

The National Time Recorder Company, of Milwaukee, Wis., will shortly commence the manufactare of a clock device to be known as the Bolte Automatic Time Keeper. It is so made that any one passing through the door in the morning sees at a glance just how many employés were late, and how many minutes, and the employes themselves can also see in plain sight the time their keys register, either at the time of recording or at noon when going to dinner.

The contracts have been let to the Globe Iron Works, of Cleveland, to build two passenger ships, which are expected to make the run from Buffalo to Duluth in 50 hours. The iron and steel for most of the large ships built on the Great Lakes has been made at the Carnegie and other Pittsburgh mills, but the orders for the steel for these new ships have been awarded to Cleveland firms. The Otis Steel Company has the contract for all the steel, the Cleveland Rolling Mill Company for rolling the plates, and the Cleveland City Forge for the heavy shafting.

Our Directory.

Buffalo, Rochester & Pittsburgh.—J. H. Barrett has been appointed General Superintendent; headquarters at Bradford, Pa.

Central New England & Western.—M. E. Blaine has been appointed Superintendent, vice I. W. Fowler, resigned.

Central of New Jersey.—I. A. Sweigard has been appointed General Manager.

Chicago, Burlington & Northern.—G. B. Harris has been elected President; office at Chicago, Ill.

Chicago & Erie.—J. Hawthorne has been appointed Master Mechanic, vice T. A. Lawes, resigned.

Detroit, Bay City & Alpena.—C. W. Luce has been appointed Superintendent, vice M. Eastman, resigned.

Fitchburg.—J. Medway has been appointed Superintendent of Motive Power, with headquarters at Charlestown, Mass., vice O. Stewart, resigned.

Great Northern.—G. W. Beck has been appointed Division Master Mechanic; headquarters at St. Paul, Minn.

Jacksonville Southeastern Line.—C. A. Henderson has been appointed Superintendent, vice D. W. Rider, resigned.

Kansas City, Watkins & Gulf.—F. S. Hammond has been appointed General Manager. The office of Superintendent, held by J. K. Lape, has been abolished.

Louisville, New Orleans & Texas.—M. Gilleas has been appointed Superintendent at Memphis, Tenn.

St. Louis, Alton & Springfield.—H. A. Fisher, General Manager, has resigned.

Savannah, Americus & Montgomery.—W. J. Matthews has been appointed General Superintendent; headquarters at Americus, Ga.

Sioux City & Northern.—J. G. Butterfield, Master Mechanic, has resigned. The position is temporarily filled by T. Rooper.

NATIONAL CAR AND LOCOMOTIVE BUILDER

NOVEMBER, 1892.

CONTENTS.

The Southern Pacific has dismissed 150 men from the shops at Houston, Tex.

A California man has proved by experiment that there is fifty pounds of oil in every ton of orange peel.

The membership of the Brotherhood of Locomotive Firemen, according to the latest report given, is 26,000.

The Jacksonville, St. Augustine & Halifax River road will build at once a six stall round house at St. Augustine, Fla.

An extension is being made to the shops of the Pennsylvania Railroad on the Hackensack meadows, near Jersey City.

The Massachusetts law prohibiting the use of fire in passenger cars goes into effect on Nov. 1. Most of the roads have prepared to obey it.

Contracts for supplying the iron work for the new plant of the Gould Car Coupler Company at Depew, near Buffalo, N. Y., have been awarded.

The Atlantic Coast Line road has received five new locomotives from the Baldwin Works, of Philadelphia, two of which are Vauclain compounds.

The engine and car house of the Bath & Hammondsport Railroad, at Hammondsport, N. Y., were burned Sept. 30 Several cars were badly damaged.

Conductors on the Columbus, Hocking Valley and Toledo road have had their wages raised from $3 to $3.25 a day, and the brakemen from $2 to $2.15.

The Pennsylvania Company is putting up a building adjoining the Union station, Pittsburgh, in which machinery will be placed to supply 826 electric lights.

Under the name of the Lackawanna, Lake Erie & Honesdale, a new company has been formed in Pennsylvania. W. H. Dimmock, of Honesdale, is President.

The Illinois Central has placed an order for 300 new cars and 50 locomotives, the Northwestern for 180 cars and 40 engines, and the Lake Shore for 120 cars and 30 engines.

The Lehigh passenger cars are rapidly being repainted the Reading's standard Pullman color, and a year from now cars painted the old Lehigh Tuscan red will be scarce on this road.

Among the new rolling stock being added to the equipment of the New York Central are 100 furniture cars, the builders of which are the Buffalo Car Manufacturing Company.

The new shops of the Florida Central & Peninsular road, at Fermandina, Fla., have been completed and are now occupied. The usual quiet of that staid old town is now dispelled by the hum of industry.

The Delaware, Lackawanna & Western has ordered a 10-wheel compound locomotive of the Vauclain type, with a wide firebox, from the Baldwin Locomotive Works. The cylinders are 13½ and 23 by 24 inches.

The shops and the round house of the Pensacola & Perdido, at Pensacola, Fla., were destroyed by fire early in October. Three locomotives were in the round house. The loss is about $20,000 and insurance $5,000,

The Great Northern is said to have finally decided upon the location for its proposed car shops at Spokane, Wash., and work will begin on the new buildings at once. The shops will give employment to about 309 men.

At the annual meeting of the Illinois Central Railroad Company the proposition of the directors to increase the capital stock from $45,000,000 to $50,000,000, in order to provide $5,000,000 for improvements, was unanimously ratified.

The Indianapolis car works will locate at South Milwaukee, the citizens having offered the inducement of 25 acres of land and a bonus of $100,000. This company expects to do an extensive business and have fully 1,200 men in its employ.

A disastrous fire occurred in the Nickel Plate freight yards at Eightieth street and Stony Island avenue, Chicago, on Sept. 30. Forty carloads of merchandise were burned. Sparks from a locomotive are supposed to have started the fire.

The Atlantic Coast Line is building at its Wilmington shops 300 freight cars, of which 225 are ventilator cars, equipped with the Janney coupler and Westinghouse air brakes. Fourteen first-class passenger and express cars are also being built.

A rear end collision on the Sixth avenue Elevated Railroad at 125th Street, New York City, Oct. 11, caused great consternation in two crowded trains and resulted in severe injury to two women and lesser hurts to a large number of other passengers.

The Brooks Locomotive Works have built a tandem four-cylinder compound for the Great Northern and are testing it on the Lake Shore & Mitchigan Southern. They have delivered 50 heavy engines to the Great Northern and are at work on 25 more.

It has been announced at the Pottsville, Pa., shops of the Philadelphia & Reading Railroad that the company has decided to paint all its main and leased line freight, gondola and coal cars black, with white lettering, as on the Lehigh Valley road.

Grand Master Sweeney, of the Switchmen's Mutual Aid Acsociation failed of re-election at the annual meeting Sept. 29, but he was chosen editor and manager of the *Switchmen's Journal*. Geo W. Wilson, of Lacrosse, Wis., was elected Grand Master.

The Duluth, Mesaba & Northern has ordered from the Pittsburgh Locomotive Works twelve 19 by 26 inch 10-wheel engines and three switching engines. Three of the 10-wheel engines are to be delivered before Dec.1 and the balance of the order on April 1.

President McLeod, of the Reading system, is making a set against the employees who are addicted to the drinking habit and who frequent saloons when off duty. The assurance has been given that he will rigidly enforce the liquor order if the oldest men in the service have to be sacrificed

The track of the Mexican International Railroad was completed to the depot at Durango, Mexico, Oct. 1, in the presence of 15,000 people assembled on invitation of Conractor Robertson. The last three ties, decorated in Mexican and American colors, were laid and the spikes driven by twelve godfathers.

The Lima Car Works, at Lima, O., were destroyed by fire on Sept. 28, except the foundry and foundry office. Loss, $50,000; insurance, $40,000. Two hundred and ten cars were destroyed. The gross loss is estimated at $100,000. Three Union tank line cars loaded with oil exploded, shaking the town.

The National Switch and Signal Company, of South Easton, Pa., has decided to move its plant to Odenweldetown, where extensive buildings will be erected on ten acres of ground. One of the inducements to locate at the new place is that the city has exempted the company from taxation for 15 years.

A charter has been filed in Pennsylvania for a new road, to be called the Lackawanna, Lake Erie & Honesdale, and which is projected to extend from Honesdale to a point on the Delaware, Lackawanna & Western, near Moscow, Pa. The road will be 24 miles long and has a capital stock of $750,000.

The Swedish State Railways are having some of their locomotives altered in accordance with the American bogie system. Instead of six wheels, the locomotive will hereafter have eight wheels, and the tender six instead of four. The alterations are being done at the works of the New Atlas Company, Stockholm.

The exports of breadstuffs from the United States during the three months ended Sept. 30, 1892, amounted to $50,609,195—a decline of $26,085,627 in comparison with the same period of 1891. This large decline of exports of breadstuffs indicates that the consumers of Europe are recovering from the evil effects of the bad harvest of last year.

The Lake Shore lacks but 56 miles of being double tracked all the way from Chicago to Buffalo. The single track consists of three miles between Venice and Marblehead Junction, just west of Sandusky; 27 miles between Pethiville and Edgerton and 26 miles between Kendallville and Dunlap. These gaps will be filled up before the World's Fair.

The reorganized Pacific Short Line Bridge Company has begun the erection of a 1,000,000 bridge across the Missouri River at Sioux City, Ia. It will be open to the use of all railroads for toll charges in nine months. Heretofore the Northwestern road, running the only bridge across the river at that place, has held the key to all Northern Nebraska, and shut all others out.

The new steamer "Gigantic," which it is reported from London will be built by Harland & Wolff for the White Star Line, will be 700 feet long, 65 feet 7¼ inches broad, will have 45,000 horse-power and will steam 25 knots per hour, but be capable of attaining 27 knots, and going across the Atlantic from port to port in four days and a half. It is said she will be ready for sea in April, 1894.

An accident on Oct. 20, on the Sugar Run Railroad, 12 miles from Bradford, Pa., resulted in the loss of two lives and the injury of several men. A section gang, through failure of the brakes, lost control of a handcar loaded with ties, on a heavy grade. While the car was going at a high rate of speed the men, one after another, jumped. All were more or less injured and two killed outright.

A number of twelve section compartment cars have been introduced on the limited trains of the Chicago and Northwestern, between Chicago, St. Paul and Minneapolis, Each compartment is supplied with a lavatory containing hot and cold water. The comfort of these trains has been greatly increased by placing the sleepers and buffet smoking car in the center, with the day coaches at the rear.

Secretary Mohler, of the Kansas Board of Agriculture, issued his final report on the wheat yield of Kansas for this year, Oct. 10. The report shows the yield of winter wheat exceeds 70,000,000 bushels. The yield of spring wheat will exceed 4,000,000 bushels. The October report on corn will not be final, but he estimates the yield will be between 135,000,000 and 140,000,000 bushels. The crop last year was 139,363,000.

A Pennsylvania mechanic has constructed a locomotive 11 feet long and of 22 inch gage. The cylinders are 4½ inches in diameter, with a stroke of 8 inches. The boiler 17¼ inches in diameter and made of steel plates $\frac{5}{16}$ of an inch thick. It has flue sheets $\frac{3}{16}$ of an inch thick. Is is an 8-wheel engine, with driving wheels 19 inches in diameter. The boiler will stand a pressure of 170 pounds to the square inch, it is said. The tender is built in proportion.

The Newport News & Mississippi Valley Company has lately received eight powerful passenger engines, to be used on the fast limited trains between Louisville and Memphis. These engines, built by the Cooke Locomotive Works, weigh 95,000 pounds, with 18 by 24-inch cylinders and 63-inch drivers, are equipped with the latest appliances in the way of air and steam brakes, are furnished with the most approved steam heating and air signaling apparatus.

The most elaborate passenger cars in the country are those recently placed in service on the New York & Chicago Limited Express of the Pennsylvania Railroad. There are nine of them altogether, and they were built especially for this service by the Pullman Company. They cost $30,000 each, the metal work being heavily mounted with gold. The drawing rooms are profusely furnished in white with gold trimmings and maroon colored damask cloth.

The trial of the Cœur d'Alene miners at Cœur d'Alene City on charges of conspiracy resulted in the conviction of four of the defendants and the acquittal of ten.

Those convicted were: George A. Pettibone, John Murphy, M. L Devine and G. Sinclair. Sentence was passed as follows: Pettibone, two years' imprisonment in the Penitentiary; Devine and Sinclair, 18 months each; Murphy, 15 months. Pending an appeal the men were released on $4,000 bonds each.

We have to report three locomotive boiler explosions since our last issue. On Sept. 27, the boiler of a locomotive on the Tennessee Coal and Iron Company's line exploded near Coalburg, Ala., and one man was killed. On Sept. 30, the boiler of a pusher engine on the Buffalo, Rochester & Pittsburgh exploded near Grove Summit, Pa., and two men were killed. On Oct. 25, the boiler of an engine on the Kansas City, Memphis & Birmingham exploded at Palos, Ala., and the engineer and fireman were killed.

Announcement is made by the Atchison company of an important change in its passenger train service, to take effect Nov. 6. A new limited train composed of vestibuled sleeping and parlor cars will be put into service between Chicago and California points, scheduled to leave Chicago every day at 10 A. M. and reach Los Angeles on the morning of the fourth day at 7:30, which is seven hours and fifteen minutes quicker than the fastest time now made. Coming east the train will leave Los Angeles at 5:30 P. M. and reach Chicago at 8:30 A. M. of the fourth day. A through dining car is to be a part of the equipment of this new train.

Twin Hopper Gondola Car, New York Central & Hudson River Railroad.

In the September issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER we described and illustrated the standard double hopper gondola car of the Baltimore & Ohio Railroad, and in this issue we present illustrations of the same kind of car as built by the New York Central road. While the two cars are intended for the same purpose, they have distinguishing features that will interest those contemplating the construction of such cars. Together they illustrate the best current practice in the construction of this type of car. The New York Central car is six inches shorter, one inch wider and nine inches higher on top of body than the B. & O. car, there being a difference of 12 inches in the height of body inside. Both cars are of the same capacity, 60,000 pounds. Both cars have inside connected brakes on both trucks, those on the New York Central car being the Westinghouse freight brake, the general arrangement of which is shown in the above illustrations: The length over end sills of the car illustrated herewith is 35 feet 6 inches, and the length over the body is 33 feet 6 inches, the inside length being even 33 feet. The width over body is 8 feet 1 inch and the width inside is 7 feet 7 inches. The height on top of body is 8 feet $\frac{5}{8}$ inches, the inside height of body being 3 feet 10 inches.

SILLS.

The side sills are 34 feet 1 inch long, and are made of Georgia or Norway pine, $4\frac{1}{2}$ inches by 12 inches. The center sills are of Georgia pine, 5 inches by 8 inches. Both side and center sills are tenoned into the end sills as usual by $1\frac{1}{2}$ inches double tenons. The intermediate sills are also of Georgia pine and are $3\frac{1}{2}$ by 8 inches thick and 7 feet $2\frac{1}{2}$ inches long, and are tenoned into end sills the same as the side and the center sills are, and after locking into the body bolster are tenoned into the bridging or cross frame trimmer blocks, the same as into the end sills. These blocks are of oak 6 by 8 inches and $34\frac{1}{2}$ inches long, and are secured to the side and center sills by double tenons. They form sills for the hopper floor, and have their top face beveled to the angle of the same. The car body is laterally trussed where these blocks are placed by truss rods 1 inch in diameter, which pass through cast angle washers on the outside face of the side sills and diagonally through the latter.

The cross center sills are of white oak and are located in the center of the car and lip under the side sills to the outside face, as shown in the drawing. They are secured to each side and center sill by one $\frac{3}{4}$-inch bolt. They are also boxed into the sills by castings with projecting lugs.

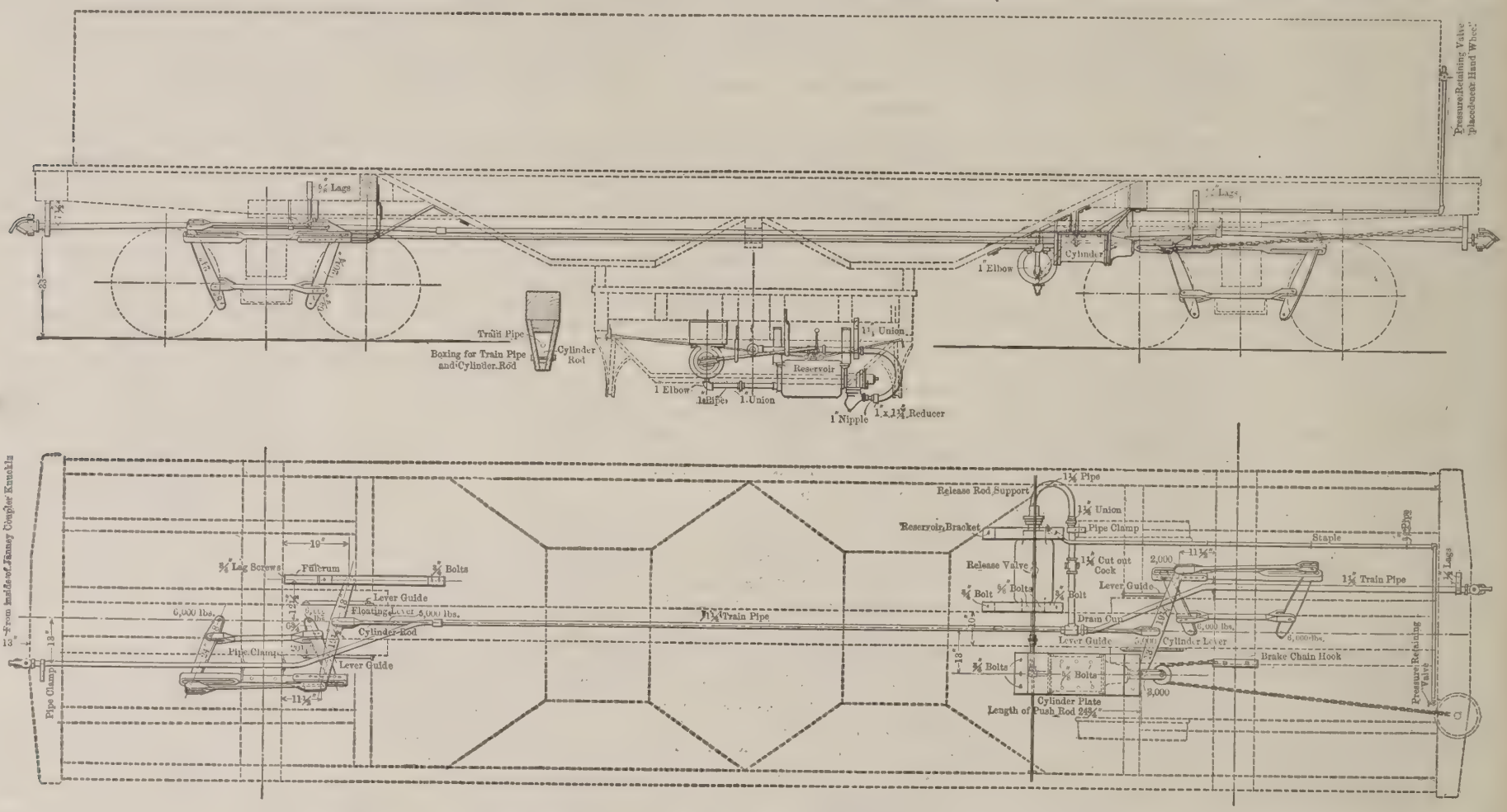
The end sills are of white oak 9 inches by 10 inches by 8 feet 4 inches. They are secured to the longitudinal sills with tenons, as described, and further by tie rods of 1-inch iron and $\frac{7}{8}$-inch bolts through draw timbers. The end sills are protected from the blows of the coupler by wrought iron plates $\frac{1}{2}$ inch by 6 inches, which are secured to the sills by 1-inch tie rods passing through the sills and body bolsters.

DRAW GEAR.

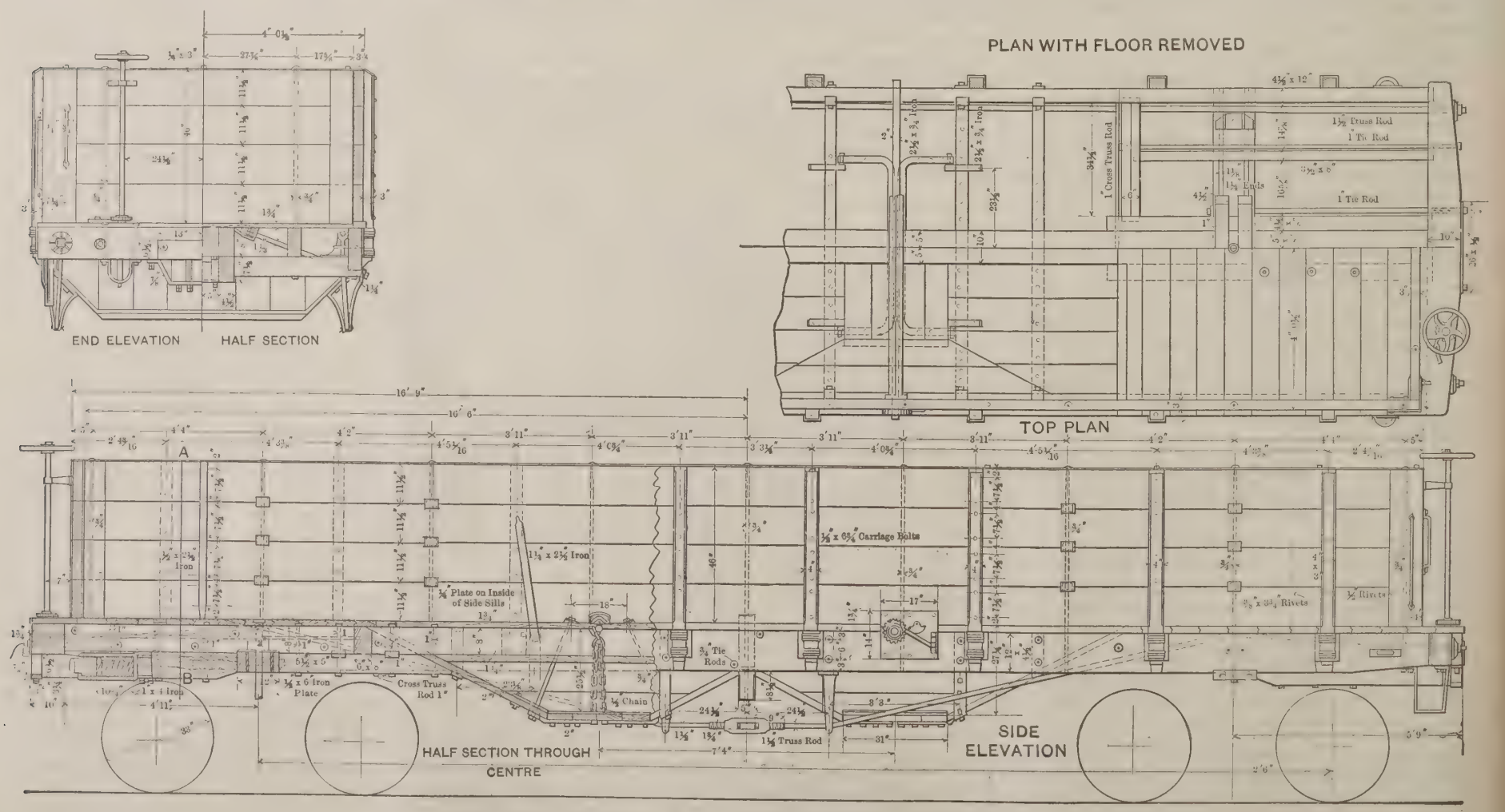
The draw timbers are framed rights and lefts, are of white oak $4\frac{1}{2}$ inches by $7\frac{1}{2}$ inches by 5 feet 3 inches, and are secured to the end sills by one $1\frac{1}{8}$ inch bolt, and to draw sill by three one-inch bolts. They are tied together by one seven-eighth inch bolt passing through back end of timbers, and are gained out one inch deep to secure the end sills, which project one inch below the longitudinal sills.

The stop-blocks each consist of one piece of white oak ten inches wide, and the back stop timbers are of the same material 5 inches by $5\frac{1}{2}$ inches by 4 feet 1 inch. The manner of their application is shown in the drawings.

Vertical plane couplers are standard for these cars, and the pull of the coupler is communicated to the body



ARRANGEMENT OF WESTINGHOUSE BRAKE, NEW YORK CENTRAL TWIN HOPPER CAR.



NEW YORK CENTRAL R. R. TWIN HOPPER GONDOLA CAR.

bolster by a tie rod one inch in diameter, the same being provided with two nuts and a split key behind the bolster.

FLOOR.

The floor is of white oak boards tongued and grooved, the tongue being $\frac{5}{8}$ inch by $\frac{5}{8}$ inch, with edges rounded. The boards are laid crosswise of car and extend two inches beyond the face of the side sill. Each board is nailed with two 30-penny nails to each sill. The top of the end sills are floored in the same manner and with the same material, the pieces extending one-half inch beyond the face of the sill.

SIDE AND END PLANKING.

The side and end planking is of hard Norway pine of uniform width. Joints are made at corners of box by means of inner and outer corner bands secured to each other through planking by $\frac{1}{2}$-inch button head rivets. The side planks are linked together longitudinally by cast iron keys, fitting in gains provided for them, and are tied vertically by twenty-two $\frac{5}{8}$-inch rods passing through planks, keys and side sills. The side planks are additionally strengthened by two wrought iron strap bolts on each side of the car. These bolts are $\frac{7}{8}$ inch in diameter, and have straps $\frac{1}{2}$ inch by $2\frac{1}{2}$ inches, with toe turned up so as to pass over top plank, and fit in boxing prepared for it.

The bottom side planks are cut out $1\frac{1}{4}$ inches on lower edge at center, tapering toward the ends to allow camber to the car, and make the side planking share a good portion of the strain.

The side planks are secured to eight white oak stakes on each side 3 inches by 4 inches thick and 4 feet $11\frac{3}{4}$ inches long; two $\frac{1}{2}$-inch carriage bolts are used to each plank and stake, with nuts on the inside. The stakes are tapered and fitted into pressed steel pockets. The siding is capped with strips of $2\frac{1}{2}$ inches by $\frac{1}{4}$ inch iron, secured by $\frac{3}{4}$-inch vertical bolts and by six $\frac{5}{8}$ inch by 3 inch lug screws on each side.

HOPPER.

The hopper flooring is supported on six wrought iron bars 3 by 1 inch, located as shown in the top plan of floor framing. The whole arrangement is so well shown in this plan that description is unnecessary. The floor is well fitted and secured to hopper bars by half inch carriage bolts spaced approximately 5 inches apart, with nut on under side of the bar. The hopper door frames are made of $2\frac{1}{2}$ by $\frac{3}{8}$ inch wrought iron, as shown in the drawings, and each door swings on two hinges which are let in flush with the hopper floor and secured to same by one $\frac{5}{8}$-inch bolt to each hinge. Each hinge is also secured to hopper bar by one $\frac{5}{8}$-inch bolt. All nuts are kept on under side. The car has four hopper doors, each pair being operated by means of chains and winding shaft. Each shaft is provided with two chains with $\frac{9}{16}$-inch links for single part and $\frac{7}{16}$-inch links for double part; and also with the customary ratchet wheel, dog, side plates, etc.

PAINTING.

The painting consists of three coats of Princess metallic brown paint, and white lettering. All iron work exposed to view on the body of the car is given one coat of glossy black, including the heads of bolts and coach screws. The trucks are given one coat of mineral brown paint; and the top of floor timbers and all mortises and tenons are painted with one coat of tar.

Some further illustrations of details of these cars will follow in our next issue.

Bending Tests of Timber.

BY J. BURKITT WEBB.*

In making transverse tests of beams of wood, cast iron, or any material that is not of uniform strength throughout, work should be done in such a way as to secure the most accurate results with the least expenditure of labor and material.

The problem may present itself in two forms:

1st. The quality of a large lot of beams is to be determined by the breakage of a number of specimens taken at random from the lot.

2d. A small number of beams of a standard material are to be broken, and the average strength of the lot determined.

In the first case, economy requires us to determine the quality by breaking as few beams as possible, while in the second case the different tests should not be unnecessarily discordant, and therefore of less value.

We propose to show that the ordinary way of testing beams by loading them with a single weight at the center is uneconomical and unscientific, whereas if two equal weights be used as a load the economy is much greater, and depends on the distance that the weights are placed apart.

It is evident that, if we could be sure of the weak place being exactly in the middle of the beam, there would be no objection to using one weight at the center, and we should arrive at the result desired, viz., the least breaking moment of the lot of beams by breaking that one beam. It is also evident that with two weights we need only be sure that the weak place lies between them, and that we are the more likely to have this condition in a beam taken at random, as we make the distance that the weights are placed apart greater.

*At Rochester meeting of the Mechanical Section American Association for the Advancement of Science.

A mathematical discussion was given at this point, in which an expression was deduced to give the probable number of beams which must be broken to arrive at their minimum strength. If the two loads be placed at one-quarter the length of the beam from its ends it is shown that if the ratio of the strength at the weak section to that of the average section of the beam is three-quarters, the probable number of beams is only eight-fifths, whereas if a single load were employed the probable number is four, so that out of every four beams tested three are uselessly broken.

But the distance between the weights need not be so large. If the distance between them be made one-quarter the length of the beam, then for values of the ratio of the weak to the average strength of a section of the beam ranging from three-quarters to one, the number of beams saved by employing two loads is from 12 out of every 28 to 28 out of 28, while if the distance between the two weights be made equal to one-eighth the length of the beam, it ranges from 12 out of 44 to 44 out of 44; or in general a saving of 25 per cent. and upward in favor of testing with two weights instead of one. The saving shows in the decreased number of beams which must be broken to obtain a result of a certain degree of accuracy.

In cases where it is desirable to employ the method by two weights, without increasing the shearing effect of the weights, a beam must be used one-third or one-seventh larger, according to whether the distance between the weights is one-quarter or one-eighth the length of the beam. This lengthening is not necessary unless the limit of shear is reached, and may probably then be avoided by an improved method of attaching the weights and supports.

Preliminary Tests of the Purdue Locomotive.

In our last issue a preliminary test of the Schenectady locomotive at the Purdue University, Lafayette, Ind., was described, as was also the mounting of the engine on the testing and recording apparatus. The information was furnished us by Prof. Wm. F. M. Goss, Professor of Experimental Engineering of the University.

The results of some further preliminary tests are now given out by Prof. Goss, a synopsis of which is presented in the following:

This series of tests was undertaken by Messrs. W. C. Wickersham and G. E. Parks, students in the laboratory, and that which is presented is virtually an abstract from the theses which they prepared. In taking observations, they were assisted by members of the junior and senior classes detailed for that purpose. The tests constitute the first work that was undertaken with the plant. Both the locomotive and the mounting machinery were entirely new, and the novel character of the latter made it an element of uncertainty until the attendants had had a considerable amount of practice in its management. All this led to some lack of constancy in the conditions prescribed and to limitations which hereafter will not be necessary. Indeed it was not expected that these early trials would be of value outside of the laboratory in which they were obtained.

The plan was to conduct such a series of tests that each one of the series would give a complete record of the locomotive's performance. The conditions for each test were to be different from the preceding only by a change in the cut-off, the speed to be controlled by throttling. It was endeavored to maintain the steam pressure constant at 130 pounds. The safety valves, which were set at 140, did not open during any of the tests, and a variation of five pounds, either side of the selected pressure, did not often occur. The quality of the steam was determined by use of a throttling calorimeter attached to one of the steam pipes in the smokebox, about half way between its connection with the dry pipe flange and the cylinder casting. All outside parts of the calorimeter were well protected from radiation, and the very short pipe connection within the smokebox was heavily covered with abestos board. The draft was measured by a U-tube; this was attached to the side of the smokebox. The temperature of the waste gases was found by means of a copper ball, which, after being exposed in the smokebox at a point near the center of the tube sheet and at about two inches distant from it, was, by a suitable arrangement, allowed to roll down an inclined pipe into the water of a calorimeter. From data thus obtainable the original temperature of the ball was calculated. During each test about three determiuations were made, the average result of which is given in the table following.

Indicators were attached to each end of each cylinder and four cards were taken at the same instant. All data given, depending upon the indicators, are based upon the average obtained from all the cards taken. The indicator rigs were temporary, and their motion was a fairly good approximate one. The coal used was Brazil (Ind.) block. The firing for all tests was done by one person, who, however, was without previous experience on this particular engine.

In making a test the engine was first started and run until the conditions of the test were had, the fire meanwhile being kept as thin as could be well maintained. When all was ready, the gong was struck, all conditions noted and the test was considered as begun. Observations, excepting those in connection with the temperature of waste gases, to which reference has already been made, were taken every ten minutes. The tests were ended by a stroke of the gong, with an allowance of about five seconds after the gong in which to take final observations before the closing of the throttle.

In every test, owing to causes already referred to, it was found necessary to make one or two intermediate stops. The longest stop thus made was one of nine minutes in the first test. The average of all the others was about seven minutes. Excepting for these intermediate stops the throttle generally was not moved during a test.

It was intended to maintain a constant stress on the drawbar of 2,500 pounds, but near the close of the series a fault in the adjustment of the dynamometer was discovered, which laid the whole of the preceding record open to question. The data for the tests appear in the following table:

TESTS TO DETERMINE THE MOST ECONOMICAL POINT OF CUT-OFF.

NUMBER OF TEST.	1.	2.	3.	4.	5.
Date of test	Apr.21.	Apr.28.	May 2.	May 3.	May 4.
Duration of engine test in minutes	170	180	180	180	180
Total number of revolutions	13,440	14,530	16,935	14,490	14,116
Revolutions per minute	79.05	80.72	94.08	80.50	78.42
Number of miles equivalent to total number of revolutions	41.87	45.24	52.77	45.15	43.68
Miles per hour	14.78	15.08	17.59	15.05	14.56
Cut-off in inches	12.5	10.7	9.	6.8	5.1
Cut-off, per cent. of stroke	52.	44.6	37.4	28.3	21.2
Release, per cent. of stroke	86.	82.7	79.2	72.7	67.9
Beginning of compression, per cent. of stroke	25.1	26.5	34.4	41.8	43.5
Boiler pressure by gage	129.5	132.	128.8	131.7	131.2
Pressure in dry pipe, by gage	42.1	52.4	60.9	72 5	94.16
Average mean effective pressure	28.46	29.74	27.9	27.09	28.04
Indicated horse power	121.9	130.	141.6	119.3	119.2
Total weight of dry coal	2,231	2,118	2,112	1,869	1,771
Total weight of ash and non-combustible	213	158	192	193	183
Total weight of combustible	2,018	1,960	1,920	1,676	1,588
Weight dry coal per square foot grate per hour	45.8	41.05	40.9	36.2	34.3
Draft in inches of water	1.35	1.22	1.	0.92	0.91
Temperature of smokebox F.	616	605	614	546	556
Number of times injector was started	17	23	20	18	18
Number of minutes injector was in action	70	67	65	62	62
Temperature of feed water	57.7	59.2	58.8	57.9	58
Pounds of water delivered to injector	14,708	14,739	14,382	12,163	12,979
Pounds lost by overflow from injector	122	165	144	126	95
Pounds of water evaporated.	14,586	14,574	14,238	12,037	12,884
Pounds evaporated per pound of dry coal	6.53	6.88	6.74	6.44	7.27
Equivalent evaporation from and at 212°	7.87	8.28	8.11	7.11	8.77
Pounds evaporated per pound of combustible	7.22	7.43	7.41	7.18	8.11
Degrees (F.) that steam at the pressure supplied the engine was superheated	26.5	19.	12.9	5.2	0
Per cent. of moisture in steam supplied engine	0	0	0	0	0.49
Pounds of steam per indicated horse-power per hour	42.2	37.4	33.5	33.6	36.
Pounds of steam per indicated horse-power per hour as shown by the indicator	30.8	28.3	25.4	23.3	21.6

It will be seen from the diagram, which is constructed from the data given, that the lowest steam consumption, as obtained by weighing the feed water, is at about one-third stroke; that shortening the cut-off after this point was reached resulted in increased consumption. Also that the

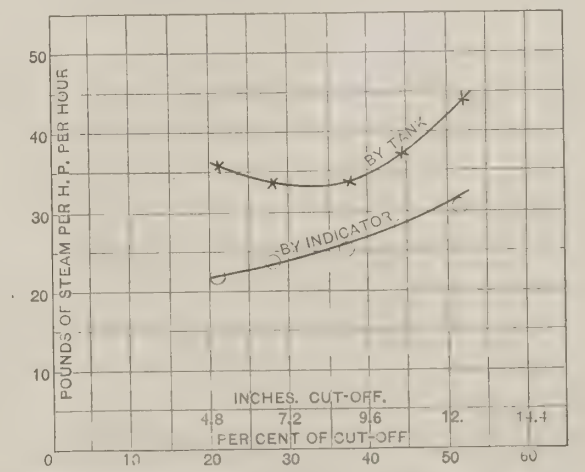


DIAGRAM SHOWING STEAM CONSUMPTION AT DIFFERENT CUT-OFFS.

steam consumption as shown by the indicator continues, as would be expected, to decrease as the cut-off is shortened, up to the shortest point experimented upon. A comparison of the two curves in the diagram furnishes a basis from which to judge of the losses brought about by cylinder condensation.

Another instance of the enterprise that is constantly being displayed by the Pennsylvania Railroad is that of the passenger department, which has decided to print circulars and time tables in the German, French, Italian, Spanish, Swedish and Portuguese languages, which will be distributed free in Europe and South America. From now until the opening of the World's Fair a persistent effort will be made to thoroughly circulate this printed matter. To further its interests in South America the company has appointed E. I. Railer its general South American passenger agent, with headquarters at Rio Janeiro.

American Society of Railroad Superintendents.

The twenty-first annual meeting of this association was held in New York City, Oct. 10. About fifty members were present.

There were present by invitation from other associaticns: John Mackenzie and R. C. Blackall, of the Master Mechanics' Association; E. W. Grieves, Master Car Builders' Association; W. H. Stearns, Roadmasters' Association; I. H. McEwen and W. H. Graves, Trainmasters' Association.

The election of officers for the ensuing year resulted in the choice for President of H. Stanley Goodwin, Lehigh Valley; First Vice-President, G. W. Beach, N. Y., N. H. & H.; Second Vice-President, C. H. Platt, N. Y., N. H. & H.; Secretary, C. A. Hammond, Boston, Revere Beach & Lynn; Treasurer, R. M. Sully, Petersburg Railroad; Executive Committee, W. G. Wattson, West Shore; C. D. Hammond, Delaware & Hudson.

The Secretary's report was then read: It shows the total number of members is 183 active, 10 associate and 1 honorary, representing 130 railroads, having a mileage of 104,989 miles. The number of applications for membership received since the last meeting is 55, representing 28 additional roads, and with the election of these members the society will have a total membership of 249 members representing 158 railroads with a total mileage of 121,462 miles. The committee on machinery made the following report on the subject of

COMPOUND LOCOMOTIVES.

The committee on machinery having received notice from the executive committee that the subject of compound locomotives had been assigned to it, after considering the same, felt before entering more fully upon the investigation desired, that it would be better to present to the society at this meeting the questions hereinafter stated, believing that discussion of the same might bring out the information desired in regard to this novel departure in railroad practice, concerning which but few of us have had any experience. In view of the fact that we to-day receive delegates from the society of master mechanics, which is the most competent body to pass upon the questions suggested, it has occurred to your committee that the society might conclude to otherwise dispose of the subject, or to issue further and more definite instructions to the committee on machinery.

Your committee is of the opinion that the advantages of compounding a locomotive engine can be realized in this country only upon a few roads--those where the conditions of service are such that the admitted economy in steam expansion were fully utilized. With a view, therefore, to suggesting a few points concerning which fuller information is needed rather than to undertake a comprehensive treatment of the subject, which only mechanical experts are capable of doing, the committee desires to submit the following questions:

1. Under what conditions are better results likely to be obtained by the compound locomotive than by the simple engine?
2. Which type of compound engine is to be preferred, a two (three) or four cylinder, and for what reasons?
3. In what class of service—freight or passenger—would a compound engine, other things being equal, be more certain to give better results than a simple engine?
4. In practice is it not likely to be the case that the additional first cost, plus the extra cost of repairs, will, taken in connection with the limited field of service of compound engines, largely, if not entirely, offset the economy claimed for them?
5. In order to obtain results commensurate with the outlay needed to compound a locomotive engine, must it not be used on runs where it is constantly required to give a heavy and continuous service?
6. Admitting the validity of the principle of compounding and thus using steam to the farthest practicable limits of expansion, is it not probable that this can be done far more efficiently by marine and stationary engines than under the conditions of locomotive service which obtain on American railroad?
7. Is not excessive back pressure in the high-pressure cylinder of compound engines found to be a very objectionable feature?
8. In compound locomotives, what is the highest pressure of steam that should be carried, and what should be the stroke and cut-off in order to obtain the best results?
9. Has not the increase of weight of the forward truck of the compound engine, especially of the four-cylinder type, been found decidedly objectionable?
10. Does not the success of the compound locomotive in actual service depend almost wholly upon the skill of the engineer and fireman in handling the same, thus requiring a special class of employés for compound service?
11. Can better results be obtained from a compound locomotive than a simple engine?
12. How much saving in fuel and water will it show over a simple engine carrying a high pressure of steam, say 180 pounds to the square inch, with a long stroke, and cutting off as short as possible, and running with the throttle wide open?
13. How much more would it cost to keep a compound in repair than a simple engine?
14. Is it not true that in using a compound you get considerable back pressuse in the high pressure cylinder?

It is true that the compound and triple expansion engines show good results in marine and stationery engines where a condenser is used, thus giving a vacuum in place of back pressure. As it is impossible to use a condenser on a locomotive, it is also impossible to get the same results or anywhere near the same results as are obtained in marine and stationary engines.

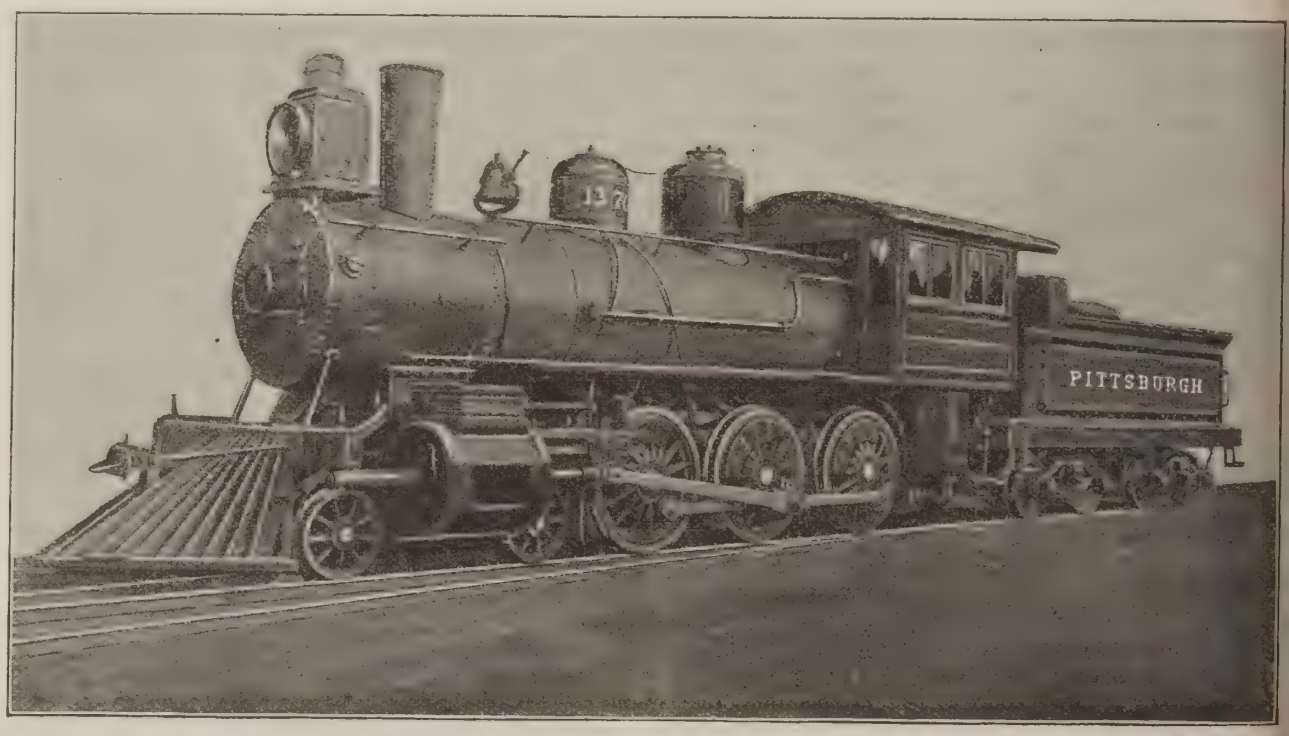
15. Where the compound engine has been tested with the simple engine, is it not true that the simple engine showed more extravagance than the general showing of hat class of engines?
16. If the compound engine was to be used, which type would you consider the most desirable, the two or four-cylinder type?
17. Does not the four-cylinder type increase the weight on the forward truck more than is desirable?
18. What class of service would you recommend for the compound—freight or passenger?

Mr. Willard A. Smith, Chief of the Department of Transportation Exhibits of the World's Columbian Exposition, addressed the meeting by invitation, on the progress of the transportation exhibit by the railways. He said that the Chicago roads have made many improvements for handling the people, and the street and elevated lines are rapidly getting ready. There will also be ample water transportation. His department has a floor space of 18 acres. Great interest has been shown by all the great railways in creating historical exhibits showing the rise and progress of the railways of both the United States and several countries of Europe. The Baltimore & Ohio, the Pennsylvania and the New York Central were all doing a great work. The display would he both instructive and interesting to not only railroad men, but the public generally. The most advanced practice of all kinds would be shown, both American and foreign. All sizes and grades of locomotives, numbering nearly 100, are to be exhibited. The foreign railway exhibits will be very large. It will be an international railway exhibit with great facilities for making comparisons. The marine section will also be very interesting and complete, embracing exhibits from all parts of the world, as I will also be that of vehicles. Demonstrations will be shown of how the Egyptians moved great masses of stone. French and German engineering societies will make fine displays. The various brake companies will make exhibits of up to 100 car trains, and study of them will be profitable. There will be a room for headquarters of railway men where all conveniences will be had.

The Pittsburgh Compound Locomotive.

The accompanying illustration, which is a reproduction from a photograph sent us by the Pittsburgh Locomotive Works, shows the compound engine recently completed at these works for the Pittsburgh & Western road. It is now being tested on that road, and we hope to publish some of the results obtained before long. The following are the principal points of interest concerning it:

Type	10-wheel freight
Gage	4 ft. 8½ in.
Cylinders	19 in. and 29 in. × 26 in.
Wheel base, driving	11 ft.
Wheel base, total	21 ft. 8 in.
Driving wheels	56 in. diameter
Weight, total	120,000 lbs.
Weight on drivers	95,000 lbs.



PITTSBURGH COMPOUND LOCOMOTIVE.

A Disgraceful Strike.

Mr. E. T. Jeffery, President of the Denver & Rio Grande road has issued a circular giving briefly the circumstances that led up to the strike of the engineers, firemen, conductors and brakemen of the second division on Oct. 15, and prevented the movement of trains for three days.

On Aug. 22, 1892, the following order regarding fast trains Nos. 61 and 64 was bulletined by the Division Superintendent, Mr. R. M. Ridgway:

Bulletin, No. 23.

Train and enginemen on trains 61 and 64 must not detain their trains to get meals at Malta or Glenwood. On leaving terminals you must go prepared to go through, as these trains must make time.

This was bulletined for the information of employés at the terminals of runs on the division. On Aug. 24, two days after the issuance of the bulletin order, Engineer William Gordon was listed to take west bound California fast freight train No. 61 from Minturn to Grand Junction. As the train was ready to leave Minturn Engineer Gordon called the Trainmaster, who was in Minturn, upon his engine and informed him that unless bulletin order No. 23, relating to detentions of trains 61 and 64 at Malta and Glenwood by train and enginemen taking meals, was recalled, he would not leave Minturn with the train. He used violent language, and stated he "did not care a damn if he never worked another minute;" he would not go out until the order was recalled, and told the Trainmaster to go to the office and repeat this to division headquarters. This the Trainmaster did at once. In order to avoid contention and disarrangement of the train service, the Division Superintendent, on being advised by telegraph of the situation, directed the Trainmaster to remove the order from the bulletin board and train No. 61 was then taken out by Engineer William Gordon.

An investigation into the action of Mr. Gordon was ordered by the General Superintendent, and was held at Salida at 10:30 A. M., Oct. 3, at which were present the following persons, constituting the Board of Investigation: R. M. Ridgway, Division Superintendent, Chairman; A. W. Jones, Division Master Mechanic; J. E. Barnes, Traveling Engineer; G. H. Barnes, Trainmaster; I. G. Baker, Locomotive Engineer (selected by Mr. Gordon).

Here follows a verbatim transcript of the proceedings of the investigating board, the substance of which is given in the following:

G. H. Barnes: This is correct; is it not, Mr. Gordon?

Mr. Gordon: It is correct.

Mr. Ridgway: Then Mr. Barnes' report of the case is correct, is it, Mr. Gordon?

Mr. Gordon: As near as I can remember.

Mr. Ridgway: I think you should remember whether or not you said you did not care a damn whether you worked for the company or not, you would not go out until the bulletin was recalled?

Mr. Gordon: I was pretty warm under the collar and thought the bulletin was unjust, and probably I said it.

In accordance with this acknowledgment the board found that:

Engineer Gordon acknowledges having used the language in his conversation with Mr. Barnes at Minturn, as reported, and that he refused to obey the bulletin order or go out until it was recalled.

A copy of the proceedings of the Board of Investigation was forwarded to the General Superintendent on Oct. 4, with the following letter of transmission, signed by Mr. R. M. Ridgway, Superintendent of Division, and Mr. A. W. Jones, Master Mechanic:

". . . You will note that Engineer Gordon acknowledges having used the language as reported by Trainmaster Barnes, also that he refused to obey the bulletin order or go out on train 61 of Aug. 24 until it was recalled. This is a case that merits dismissal from the service, and we would recommend that it be done."

The General Superintendent, in considering the matter, gave due weight to the previous record of Engineer Gordon, and in consideration thereof overruled the recommendation of the Division Superintendent and Master Mechanic, and directed that Engineer Gordon be suspended for 30 days. In conformity with the order of the General Superintendent, Engineer William Gordon was notified of the decision, his suspension taking effect from Oct. 2, the day he was taken from his run pending investigation and decision.

The care taken to obtain all the facts, and in a calm and judicial spirit take action in the case, is illustrated by the deliberation and patience shown in the action of the officers as above outlined.

The case was taken up by the employés of the Second Division, and apparently secret meetings were held, and at 2:10 o'clock on the morning of Saturday, Oct. 15, the following message was received by General Superintendent Sample, at his residence in Denver:

MINTURN, Col., Oct. 14, 1892.

Mr. N. W. Sample, General Superintendent D. & R. G., Denver:

By action of emplovés taken at a union meeting at Minturn, Oct. 7, we as a committee hereby request the reinstatement of Engineer William Gordon and full time from the date of his suspension. This matter to be made known by a bulletin being posted at Salida, Leadville, Minturn and Grand Junction. This bulletin to be conspicuously posted by 7 o'clock, A. M., Oct. 15, and unless such bulletin is posted by such time, we as the engineers, conductors, firemen and brakemen positively refuse to handle trains on Second Division after 7 o'clock A. M., Oct. 15. By order of

(Signed) COMMITTEE.

In accordance with the threat expressed in the telegram the engineers, conductors, firemen and brakemen of the second division, which extends from Salida to Grand Junction, abandoned and refused to take out their trains at seven o'clock in the morning of the same day (Oct. 15, 1892), and no trains have moved over the division since that time.

As early as practicable after the receipt of the above, and on the morning of the same day, the general superintendent telegraphed to Superintendent Ridgway and Master Mechanic Jones as follows (repeating the telegram from the committee):

You will see that no names are appended to the telegram, nor was any conference asked for, nor the least consideration shown to the company, nor to me personally, as the general superintendent. I doubt if any set of railway men in the United States ever acted as arbitrarily and with less regard to the interest of their company than have the men on the second division in this case. It seems to be impossible for reasonable and right thinking men to continue this course, and if it has not already been done I wish that you and Master Mechanic Jones would at once confer with some of the second division engineers and conductors for the purpose of showing them the wrongfulness of the action taken.

N. W. SAMPLE.

The notification received by the General Superintendent at 2:10 A. M., Oct. 15, five hours before that portion of the line was tied up, was the first information, or even intimation, received by the company of the contemplated strike. Believing that friendly conferences between employer and employee for the purpose of adjusting differences are desirable, and that to avert a strike, disastrous alike to the company and to the men, and in its effects greatly injurious to

the public, arbitration in this case might be resorted to the following telegram was sent at 5:16 to the Division Superintendent:

DENVER, Colo., Oct. 15, 1892.

R. M. Ridgway, Salida:

I shall be glad to confer with any committee of our employés for the adjustment of any grievances, and if we cannot agree am willing to arbitrate matters of difference; in the meantime the men should return to and remain at work pending adjustment, either by conference or arbitration. The company has always treated its employés liberally and justly, and the present strike, almost without notice, will not be sustained by railway employés generally, or the public. Give a copy of this message to the committee.

N. W. SAMPLE.

To this the following reply was received by the Division Superintendent, and immediately transmitted by telegraph to the General Superintendent.

SALIDA, Oct. 15, 1882.

N. W. Sample Denver:

Following report from the committee received.

R. M, RIDGWAY.

SALIDA, Oct. 15, 1892.

R. M. Ridgway, Salida:

We, the employés of the second and third divisions, instruct our committee to inform you that we will not accept Mr. Sample's terms, and that we will remain out until a settlement is made amicable to ourselves.

EMPLOYES TRAIN AND MOTIVE POWER DEPARTMENTS,
SECOND AND THIRD DIVISIONS.

From the foregoing it will be seen that even arbitration, for which so many labor organizations have contended, is refused by the men through their duly appointed committee.

E. T. JEFFERY, President.

DENVER, October 16, 1892.

Some comment on this strike will be found in our editorial columns.

Giant Railroad Ferryboats.

The first of a number of car steamers for ferry service across Lake Michigan was launched by the Craig Shipbuilding Company, Sept. 28. She was christened the "Ann Arbor, No. 1." The new boat will go into service in connection with the Toledo, Ann Arbor & North Michigan Railroad. Cars will be carried without break of bulk between Pewaukee and Frankfort. Twenty loaded cars will be carried at a time.

The ferryboat "Solano," which is owned by the Southern Pacific Company, and has been used for the transit of cars across the Straits of Carquinez for many years past, is the largest ferryboat in the world. She has the capacity to take aboard 48 loaded freight cars, or over twice as many as any of the new line of ferryboats mentioned above. The *Pacific Lumberman* gives the following description of the this boat: The "Solano" is really the largest vessel afloat, now that the steamship "Great Eastern" has been broken up. Her length is 424 feet. That is equal to the length of any of the 6,000-tonners belonging to the Pacific Mail Steamship Company. She has a beam of 116 feet, which is greater than the beam possessed by any other vessel in existence, not excepting the circular-shaped yacht owned by the Emperor of Russia. She was built at the West Oakland yards about 10 years ago, and 1,500,000 feet of lumber were used in her construction. Her decks are equipped with four sets of railroad tracks, and she is propelled by two vertical engines of nominal horse power, which are fed with steam by eight steel boilers working in pairs, and each pair being furnished with a separate smokestack.

Notice of "Railway Car Construction."

(From the Manufacturer's Record.)

This is the first book which has ever been prepared upon this subject, and the thorough and masterly treatment of each detail gives it a high place among text books. The construction and dimensions of freight cars, class of timber used, various kinds of trucks, with dimensions and other detailed information, are presented with a thoroughness which enables the reader to judge which of the various forms is most suitable for any specified purpose. Passenger cars, parlor cars, the trucks and general fittings are all accurately described and illustrated. The writer deserves the greatest credit for the completeness of his work and the excellence of the drawings and descriptions. To the car builder and railway mechanic this book will be invaluable in showing methods of construction.

In a letter to the Navy Department from Unalaska, dated Sept. 24, Commander Evans, of the Yorktown, states that a new and violent volcano broke out on the Alaskan peninsula in about latitude 56 deg. north, longitude 159 deg. 20 min. west. The noise of the eruption, which took place during the last week of August, was heard at a distance of 90 miles, and the clouds of ashes and cinders were so dense at a distance of 159 miles at sea that the steamer St. Paul was compelled to light her lights at 10 o'clock in the morning. Her decks were covered with ashes to such an extent that many bucketfuls were swept up and thrown overboard. No loss of life or property from the explosion had been heard at the date of Commander Evan's letter.

The official report of the Chicago, St. Paul & Kansas City Railroad Company for the fiscal year ending June 30, 1892 has just been issued. The gross earnings of the company were $5,024,740, an increase of $663,889. Operating expenses amounted to $3,664,677, against $3,285,340 for 1891, an increase of $379,337. The net earnings were $1,360,063, against $1,075,511, an increase of $284,552.

A Wheel Record.

A paper by Mr. J. N. Barr, Superintendent of Motive Power and Car Department of the Chicago, Milwaukee & St. Paul Railway, appears in the August issue of the *Journal of the Association of Engineering Societies*, describing a wheel record that is kept on that road. The following is an abstract:

It is found that wheels fail or are condemned principally from four causes:

1st. Failure of the shell of chilled iron. 2d. Abrasion. 3d. Breaking or fracture. 4th. Application of Brakes.

Under the head of "Failure of Chill" there are four distinct forms which manifest themselves; three of these are due to disintegration of the white iron and are termed "shelled out," "comby" and "seams." The fourth form is caused by wearing through the shell of white iron where it is thinnest, and is distinguished by the term "worn flat."

The failures due to "abrasion" may be classed under two heads: "worn flange" and "tread worn hollow," but in nearly every case in which a wheel is condemned on account of tread being worn hollow, the wear is not evenly distributed over the tread, but occurs either close to the flange or out on the tread entirely removed from the flange. It has, therefore, been found convenient and useful to distinguish between these and use two terms: "tread worn hollow at flange" and "tread worn hollow from flange."

An inspection of a number of broken wheels reveals the fact that each particular form of pattern has to a great extent its own peculiarities as to manner of breaking, but the wheels under this head may be classified as follows: "Broken Flange," "Broken Rim," "Cracked Plate," "Cracked Between Plates," "Burst" and "Broken in Pieces."

Under the head of wheels condemned on account of application of brakes, the one term "Flat from Sliding" is used.

The above mentioned small list of defects really covers the whole subject, and when carefully applied in a record will give definite information as to the condition of condemned wheels.

With regard to influence of service, it can only be said at this point that no definite results can be obtained as long as it is attempted to consolidate the returns from wheels of different sizes, or from wheels of the same size, under cars or engines varying much in weight or speed.

STATEMENT SHOWING DEFECTS OF CAST-IRON WHEELS AS INFLUENCED BY KIND OF SERVICE DURING 1890.

Class I. (Chill Failing.)

Kind of service.	Diam. of wheel.	Shelled out. No.	Shelled out. Average mileage.	Shelled out. Per cent.	Comby. No.	Comby. Average mileage.	Comby. Per cent.	Seams. No.	Seams. Average mileage.	Seams. Per cent.
Passenger	33	148	92,007	16.8	1	92,307	0.1	12	99,868	1.4
B., M. & Ex	33	178	98,891	22.7	..	.....	....	11	113,850	1.3
Parlor and sleeper	33	7	91,517	36.8	..	.....	....	..	.....	....
Engine tender	33	1,277	60,724	53.0	6	87,100	2.0	18	97,498	7.0
" "	30	38	65,472	41.8	.	.....	....	1	35,702	1.1
Engine truck	30	390	48,664	49.2	2	30,580	0.3	15	83,860	1.9
" "	28	316	40,771	53.2	7	40,771	1.2	4	60,161	0.7
" "	26	13	31,001	27.7	6	31,001	12.8	..	.....	....

Class II. (Wear on Rail.)

Kind of service.	Diam. of wheel.	Worn flange. No.	Worn flange. Average mileage.	Worn flange. Per cent.	Worn thr'd. No.	Worn thr'd. Average mileage.	Worn thr'd. Per cent.	Worn flat. No.	Worn flat. Average mileage.	Worn flat. Per cent.
Passenger	33	67	97,413	7.6	61	149,263	6.9	4	105,547	0.5
B., M. & Ex	33	65	110,426	8.3	59	125,168	7.5	7	115,025	0.9
Parlor & Sleeper	33	3	77,030	15.8	1	153,145	5.3	..	.....	....
Engine tender	33	318	80,332	13.2	56	107,187	2.3	49	121,768	2.0
" "	30	3	99,570	3.3	5	100,562	5.5	23	69,610	25.3
Engine truck	30	210	55,594	26.5	16	88,136	2.0	10	69,020	1.3
" "	28	100	55,918	16.8	17	59,366	2.9	9	61,075	1.5
" "	26	2	52,201	4.3	..	.....	..	19	41,701	40.4

Class III. (Broken.)

Kind of service.	Diam. of wheel.	Cracked plate or brackets. No.	Cracked plate or brackets. Average mileage.	Cracked plate or brackets. Per cent.	Other defects. No.	Other defects. Average mileage.	Other defects. Per cent.	Total. No.	Total. Average mileage.
Passenger	33	1	104,001	0.1	354	46,994	40.4	832	77,437
B., M. & Ex	33	..	.....	....	250	49,890	31.8	785	88,629
Parlor and sleeper	33	..	.....	....	2	5,940	10.5	19	86,780
Engine tender	33	1	33,288	....	247	44,928	10.2	2,411	69,482
" "	30	..	.....	....	7	46,560	7.7	91	68,306
Engine truck	30	..	.....	....	80	58,664	10.1	793	53,679
" "	28	1	9,279	0.2	91	58,552	15.8	594	47,523
" "	26	..	.....	....	5	52,344	10.6	47	39,604

Class II. and III. (Wear on Rail and Broken.)

Kind of service.	Diam. of wheel.	Worn hollow at flange. No.	Worn hollow at flange. Average mileage.	Worn hollow at flange. Per cent.	Worn hollow from flange. No.	Worn hollow from flange. Average mileage.	Worn hollow from flange. Per cent.	Broken rim or flange. No.	Broken rim or flange. Average mileage.	Broken rim or flange. Per cent.
Passenger	33	174	91,511	19.7	49	106,020	5.5	12	115,583	1.4
B., M. & Ex	33	146	99,594	18.6	55	115,797	7.	14	118,868	1.8
Parlor and sleeper	33	6	102,016	31.6	...	.....	...	...	.....	...
Engine tender	33	259	82,936	10.7	113	103,369	4.7	67	89,532	2.8
" "	30	4	39,527	4.4	2	39,957	2.2	8	90,170	8.8
Engine truck	30	37	62,197	4.7	16	61,671	2.	17	30,272	2.1
" "	28	26	45,807	4.4	14	49,202	2.4	6	49,60	1.
" "	26	...	.....	....	...	.....	...	2	35,881	4.3

It will possibly be interesting to give a short sketch of the origin and development of the wheel record, so far as my experience goes, and this will no doubt give additional point to some of the preceding remarks. When the wheel record was first established, reports were made weekly from each shop of all wheels used under and drawn from passenger equipment cars and from engines. These reports gave the wheel number, the date cast, the car number and the condition of the wheels drawn. The mileage of the wheels drawn was ascertained from the record of car mileage. At the end of the year a statement was made of the mileage of wheels drawn. The statement showed the average mileage of wheels of the same size drawn from passenger and freight engines collectively, giving each make of wheels separately. Each man reporting wheels used his own discretion as to the best manner of describing the condition of the wheels drawn.

You will notice here that a distinction was made between the service of wheels under cars and under engines. This was a step in the right direction, but as you will see further on it did not go far enough, and the maker who was fortunate enough to have his wheels placed under freight engines had about 2,000 miles in his favor, as compared with the same quality of wheel placed under passenger engines. The record was continued in this form for several years, but in a short time there was a distinction made between wheels under passenger engines and freight engines. Soon a separate statement was made for wheels drawn from Pullman cars. Many of the wheels reported found their way to the wheel foundry and an endeavor was made to compare the condition of the wheel with the reports from the road, but met with a repulse at once from the formidable array of terms used in describing the condition. For example the condition of the wheel designated by the term "shell out" was described in the weekly reports by the following terms: Rough, worn out, bad manufaoture of chill, flaw on tread in casting sandholes, bad chill, worn in holes, and flaws. Each shop had its own pet term, and in that case the same term did service for almost any condition of wheel. In view of these discrepancies a circular was issued by our company which required inspectors to use the terms before mentioned and none other. This certainly resulted in a great reduction of the number of terms used on the weekly reports, but the men were not inclined to use this term with sufficient discrimination to guarantee strict accuracy, and the old tendency to a fondness for the use of some particular term began to manifest itself.

After the wheel record had been in operation about five years, one of the most important steps in the history of the record was taken. It was required that all condemned wheels drawn during any month should be shipped to the foundry before the tenth of the succeeding month. These wheels were all inspected on unloading them from the car, and the report of the condition of the wheels from this inspection placed on the record beside the report from the road. All discrepancies were promptly reported to the inspector responsible for the same, and in a short time such discrepancies were few and far between.

In addition to securing more accurate records, another and extremely important result was accomplished; the proportion of wheels found to be good for further service increased enormously.

Wreck of a Famous Locomotive.

The *Altoona Gazette* in relating the circumstances of a wreck on the Pennsylvania road near Altoona, in which engine 1149 was involved, says:

"It was No. 1149, the engine that on the memorable day of the Johnstown flood went rushing down the Pennsylvania Railroad tracks from Conemaugh to Johnstown with its shrieking whistle giving the alarm of the oncoming deluge of water. After the flood No. 1149 was found, bottom upward, buried under a bank of sand, near where the engineer had abandoned it to flee for his life from the flood. After things had quieted down No. 1149 was set on its feet and brought to Altoona. After a week in the shops it came out again showing no signs of the ordeal it had passed through. Since then it has been run as a shifter. Yesterday about noon No. 1149 was standing on the track near the BO telegraph station. Just below it was a heavy coal train, stationary, with all brakes set. Engineer W. D. Thomas happened to look back over the track and saw another coal train, without an engine, come tearing down the steep grade. The switch had not been turned to allow it to drop down on the next track, as was intended. Thomas jumped just before the crash and escaped, but No. 1149 was turned bottom up and demolished between the two heavy coal trains."

It is possible that the plucky 1149 may turn up again, "showing no signs of the ordeal it has been through." Locomotives have a habit of getting "demolished" in wrecks, but a few weeks in the shop with good hospital attendance often brings them around all right.

Invention of the Incandescent Electric Lamp Awarded to Edison.

In the case of the Edison Electric Light Company against the United States Lighting Company, which has been pending for about five years, a decision was reached Oct. 4 by the United States Court of Appeals awarding the incandescent lamp to Edison.

The main issue of the case was based upon the second claim of Edison's patent, dated Jan. 27, 1880. According to the interpretation of the court Edison's second claim is as follows: "The combination of carbon, filamentary or thread-like in size and properly carbonized, used as an illuminant in an incandescent electric lamp, with a receiver made entirely of glass and conductors passing through the glass and from which receiver the air is exhausted to such an extent that disintegration of the carbon due to the air-washing action of surrounding gases or to any other causes is so far reduced as to leave the carbon practically stable."

Although the present case does not involve the means or the method of the distribution of the current, the lamp constructed according to this claim is the principal factor in a distribution system. Without such a system commercial success could not be attained in incandescent lighting.

Master Car and Locomotive Painters' Association.

The twenty-third annual convention of the Master Car and Locomotive Painters' Association of the United States and Canada was held in Detroit, Mich, on Sept. 14, 15 and 16.

After addresses by Mr. Corliss in behalf of the city of Detroit, and by the president, Mr. J. A. Gohen, Secretary Robert McKeon submitted his report showing that 27 new members had been admitted to the Association during the year, and 21 old members dropped from its rolls for various reasons, leaving a total membership of 154. The finances of the Association are reported in good condition. A communication was received from the Master Car Builders' Association acknowledging receipt of a letter from the Master Painters' Association, and expressing sympathy with its aims and objects.

The election of officers resulted in Mr. Wm. O. Quest, of the Pittsburgh & Lake Erie, being elected President; Vice-President, Wm. J. Orr; Second Vice-President, W. T. Leopold; Secretary, Robert McKeon.

The Piece-Price System

There were three articles read upon this subject. We have space but for one, and give that submitted by Mr. J. P. Stroud: The subject upon which I have been assigned to speak before this convention, viz.: "Would it be practicable for railroad companies to adopt the piece-price system in the paint department on all roads?"—is one in which I am very much interested, and to which I have given considerable attention in the last few years.

My experience in the matter has left me with but one view of the question, and that is: Yes; undoubtedly it is practicable and eminently profitable as well, both to employer and employé. Not only in the paint shop, but in all other departments as well, it is, to my mind, the only satisfactory adjustment of the question of capital and labor. You pay a man only what he is worth—no more, no less. It is the only just way of working—equally so to the employer and men.

To my mind this subject needs no elaborating. A simple, statement of facts is all that is necessary to convince the most skeptical; and the facts are these:

1. It is just and fair to both the company and the men. The man gives an honest equivalent in work for the money he receives.

2. It is economical to the company. They get more work done for less money.

3. It means better pay for the men. They receive from 30 to 50 per cent. more wages.

4. It makes better mechanics. Where formerly a man was contented to dawdle along and put in his time for two dollars a day, he now brushes up his wits and put his mind to work on the problem of how to make more money. He solves it, too. There is nothing like a chase after the almighty dollar for sharpening one's wits and developing any little inventive genius we may possess, until it is really astonishing the new and improved methods of working that are set in motion and become the accepted code.

5. A larger amount of work can be turned out in a given time, and the foreman is able to estimate accurately the amount of work he can handle.

And, sixthly, to my mind the crowning argument in favor of the piece-price system is the dislike the men themselves show to return to day work for even an hour. A general return to the old system would, I am sure, result in disaster.

As for suggesting any plan or schedule for doing the work that would apply to all shops and all classes of work, that is a more difficult matter, as in no two shops are the conditions or methods of working the same. But let each foreman be a law unto himself and by timing and averaging, he can soon strike the happy medium. For instance, where a piece of work has required eight hours time of a man of average ability, at 20 cents an hour, I would allow for that job $1.20. Or, take each piece of work in the shop and find out how much it costs now by the day. Deduct 20 to 30 per cent. from that cost and give the job at the new figure to some man of average ability. Compare his results with the first cost, and if you find you are paying too much for that piece of work, make a further reduction until you have it about right. Of course, this cannot be done in a week or a month, but by starting with one set of figures, he can change and remodel and prune as the necessity arises until he has matters just as he wants them.

It is now six or seven years since the piece-work system was adopted in our shop. I was probably six months or a year in getting a satisfactory schedule of prices, which has not since been changed, and now *everything* from scrubbing an engine or varnishing a coach down to sweeping out the shop has its permanent price. And I see no reason why the number of men or the size of the shop should make any difference or prevent the successful operation of the piece-price system.

A long but animated and interesting discussion of the subject followed, an abstract of which will be give in our next issue. A resolution was finally adopted, with but a few dissenting votes, that the piece-price system is practicable in all railroad paint shops.

Colors for Car Bodies.

The two following papers by John A. Putz and C. M. Lang were read on this subject:

MR. LANG'S PAPER.

"The subject assigned me, namely, 'Which are most durable, light or dark colors on passenger car bodies; and which is the least expensive to maintain, yellow, Pullman color or 'Tuscan red,' is a subject in which I am very much interested at the present time, as the Old Colony road has recently changed the color of its passenger and baggage cars from a yellow to nearly a Pullman color, although it shades a little more on the red than Pullman color. But we have had both yellow and Pullman color running on the road for the past eight or nine years, and therefore have had a pretty good chance to ascertain which is the most durable, and I should say, without any hesitation that the dark color is the most durable.

I am well aware that it has been argued for years that al dark colors attract the rays of the sun to a greater extent than the light colors, and have no doubt but that it can be so proved by experiment; but when it comes to a practical test on the body of a coach I do not admit that it can be proved. That is, I do not admit that the light color will outlast the dark on that account; perhaps it would if it took as many and as heavy coats to cover. I contend that as it takes from two to three coats less of the dark than of the light to cover, and provided always that you have a sufficient amount of substance in the priming and under coats under the color to hold it out, as you would with the light, that the dark color will outlast the light by several years; that it will clean and varnish easier and come out looking better every time than the light color, and give better satisfaction to all concerned. There is also another argument in favor of the dark color, although it does not come in on the durability, and that is in the making up of trains. What is there that looks worse than to see a clean yellow car just out of the shop put into a train of dirty cars? I know of nothing, unless it is the putting of a dirty yellow car into a clean train; either one will spoil the looks of a train, and you have noticed that passengers will fill the clean cars and dodge the dirty ones. You will not see this so readily in a train of Pullman color cars, as a dirty Pullman color does not show up like a dirty yellow. In painting our light cars we have made the bodies yellow; the corner posts, hoods and letter boards, Tuscan red, with a black panel laid over the red for the letters. And I have failed to see but what the black panels have stood as well as the yellow body.

This brings us to the second part of the question, "Which is the least expensive to maintain, yellow, Pullman color or Tuscan red?" I have not had as much experience with Tuscan red as with the other two colors, but from what I have had should say the Tuscan red would be the most expensive to maintain, the yellow next and the Pullman color the least expensive; as I think the Pullman color holds its color better than either of the others, with the yellow next, while with the Tuscan red we have been obliged a great many times to paint out the letter boards and corner posts on account of its fading out and turning gray, when the yellow body of the car would be in good condition. While with the Pullman color even after it is badly checked after years of service the checks do not show nearly as much as they do on either one of the other colors.

MR. PUTZ'S PAPER.

What are the most durable, light or dark colors on passenger car bodies? Which is the least expensive to maintain, yellow, Pullman color or Tuscan red? In order to arrive at a proper solution of these questions it will be well to consider the components of the different paints. Now what is the material of which our light colors are mainly compounded? The main ingredient, as we all know, is carbonate of lead, with the addition of either chrome yellow (which is also a carbonate of lead colored with bichromate of potash) or it is golden ochre, and perchance some other minor ingredient which is hardly worthy of mention. Now we know that lead properly compounded forms a dense body, and, in my estimation, is the only substance to properly seal the pores of wood. I presume quite a number of my colleagues will differ with me in this, but when we consider that we have to produce an elastic yet at the same time a body that will be sufficiently hard so as not to crack a seam, I hold there is no other substance, no matter how we may compound it, that will produce these results in as perfect a manner as the carbonate of lead. As a matter of course, when we take the length of time into consideration in which we are compelled to finish a piece of work, then it becomes somewhat difficult to maintain the lead process fully, for in order to produce a good piece of work it does require a little more time, but I maintain that if we have sufficient time the lead process is far superior to any other. If properly prepared and sufficient time given, it is the most durable, as it will neither crack nor blister when due precautions are taken, and it will (when properly taken care of) last for quite a number of years. And even without proper care it will last a great deal longer than any other process. Not only this one case, but many cases which have come under my observation during my life as a painter, have led me to the conclusion that, compared with other pigments, lead is the best that can be placed on the body of a car, as it will withstand atmospheric influences and the action of gases much better than any other. Although we are at present painting our passenger equipment a dark color similar to the Pullman, yet in all my experiments to produce a good and lasting foundation, I find that a lead foundation is the best, and if lead is the best foundation the question arises why should it not be best for all succeeding coats.

Now to the remaining part of the question. Which is the least expensive to maintain, yellow, Pullman color, or Tuscan red? You have by this time seen that my preference is the light colors, inasmuch as they are mainly composed of lead. They form a more compact body and, therefore, have a tendency to hold out the varnish a great deal better than the dark colors, which are more or less porous and therefore are calculated to soak up the varnish. But then it may be said that if the colors soak up the varnish they will form a compact body, and would withstand the action of the atmosphere and the gases better than if the varnish merely forms a film over the color; but bear in mind that if we depend entirely on the varnish our work will last but a little while, for as soon as the life of the varnish is gone we have nothing left but a spider web cracked surface which will let in the action of water, atmospheric and gaseous influences. The lead itself forms a compact body, and possesses the merit of withstanding atmospheric or gaseous influences. It may be said that the sulphuric and carbonic acid gases, which are generated by the burning of the coal as used on our engines, have a very harmful or deteriorating influence on the lead. I am ready to admit that such is the case, but is it any more so than is their influence on umbers, ochres, or other earthy substances? I hold that such is not the case, as these earthy pigments are far more easily acted upon by gases (especially the sulphuric acid gas) than is the lead. If, then, the lead has a greater tendency to withstand the action of the gases than the earthy pigments, it is almost a necessary consequence that the lighter colors, which we know are mostly composed of lead, are far less expensive to maintain than are the darker colors. In the first place they do not so easily fade as do the darker colors, and after being properly cleaned they are much easier matched, when this becomes necessary, than the darker colors. Secondly, as the lead forms a more compact and tougher surface or body than the earthy colors, it stands to reason that a body produced by the lead will stand a great deal more wear and tear than the others possibly can. As far as the Pullman color is concerned, I find there is a great deal of difference in the maintenance of the color as it comes from the different establishments on paint producing factories. But we all know how difficult a matter it is to match a faded Pullman color. It is almost a fruitless task to try and match it to our satisfaction. To be sure, I can match the color so as to be passable, yet there is always something lacking which I cannot overcome, as the fading of the color is so peculiar that I have never been able to discover anything that would entirely meet it.

Now in regard to Tuscan red, in my estimation it is a very good wearing color when it has the proper foundation, and a comparatively easy color to maintain. Inasmuch as the pure Tuscan red is a peroxide of iron, it has nothing in common with the earthy pigments of which most all other dark colors are composed. But the question presents itself: Can we obtain a pure Tuscan red? I hold this to be very doubtful. It is much easier to match than other dark pigments, and therefore much preferable. But after all if we desire a color of the maroon or solferino shade why not use Indian red, for we know we can get that pure, and as it is also a peroxide of iron, it will wear well, as it forms a very compact body and will hardly fade at all under any circumstances, and is therefore very easily matched when necessary.

Mr. Ball: It seems to me that we want to start in understandingly in this discussion, and from the tenor of the papers read they are likely to confuse us some if we do not get at the bottom of it. The paper read by Mr. Putz, seems to be rather a defense of the lead system of painting than an argument in favor of any particular color as to durability on account of its color. The question as I understand it is to draw out the views of members as to the best wearing color, its permanence and its power to resist the action of the sun and chemical changes. Even admitting that lead is the most durable pigment to be found for a foundation, might not other pigments be used as a body color without admixture of lead, that is, after you have used your lead for laying on up to your foundation. I do not think it would be claimed that a pigment to be durable must be mixed with white lead; that white lead adds to the durability of the pigment. This is a question that has been talked over at these conventions time out of mind. And at every convention at which the subject was ever brought up we went away about equally divided, one-half concluding that a dark color stood the best, and they tried to prove it by panels to show how long they had lasted—such colors as dark brownish greens and Pullman colors, and others again brought other panels with cream colors and drabs and buffs, and there was never any conclusion reached positively as to which was the most durable as a color, and I doubt whether we can arrive at any conclusion, although a ventilation of the subject may do some good. In my opinion the matter can only be determined by the composition of what colors are used; the composition of the pigment. If the pigment used, no matter whether it is dark or light, is not subject to chemical changes, it is going to wear any way, without regard to whether it is a dark color or a light color. I remember that there were some experiments made at different times with the thermometer in connection with these colors. The panels were painted, they were hung out in the sun and the thermometer was stuck up against them and the heat was registered up to about 110 or 120, and they were kept in that position for quite a length of time, and other panels were treated in the same way, and I have no recollection of any determination having been come to as to one being any better than the other.

Mr. Billings: My first experience in painting was in light cars, and I have painted them for years, but of late years I have used Pullman color. My experience in early days in matching colors was with light colors. I found it always gave trouble to match it, and never could match it. The only thing you could do would be to take a little dirt and throw in it; it was the nearest we could come to it. As regards Tuscan red, Mr. Ball has stated my ideas on that. I think pure Indian red would approach nearest to economy in color on a car. In using Tuscan red, as I have now for some 10 or 12 years, I find we have very little trouble; we can match most any color there is, and I claim it can be done with less trouble than with any other.

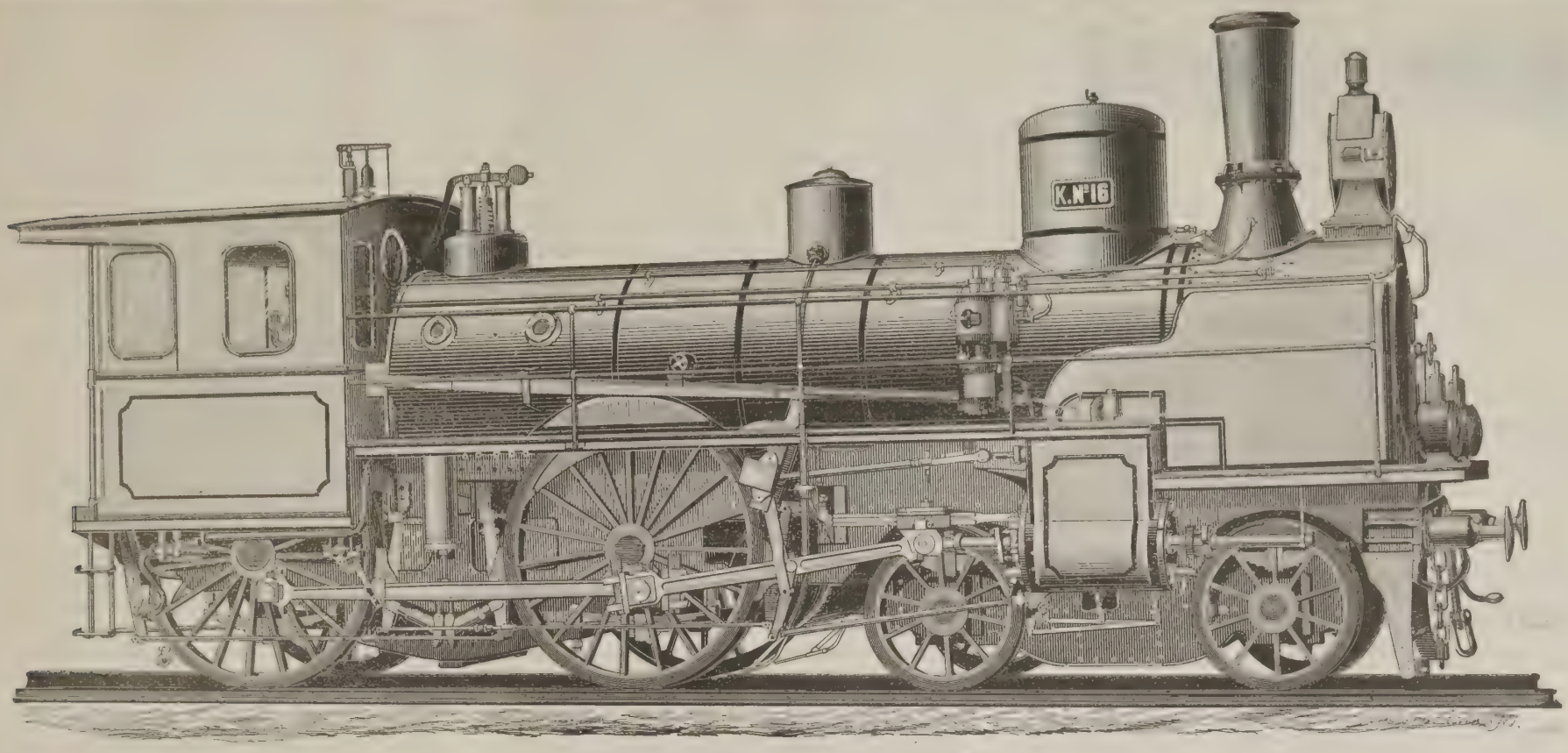
Mr. Rattenbury: I don't think the difference in price of keeping up a dark colored car and a light colored car will differ a dollar in the expense in a year. I don't think there is enough in it to talk about. If you have the right material use the right material.

Mr. McCullen: The question is about this painting of cars with one color or another. My experience of 38 years is that we have never come to any conclusion about it at all. I will say that Tuscan red is the cheapest thing we can use. It is a matter of the taste of the corporation. Some want Pullman color, some want Tuscan red and some want something else, but when it comes to the matter of economy, Tuscan red beats them all. One coat has more covering qualities than yellow. Take a Pullman color, I would just as soon have that too, but I say I can cover more of anything with one coat of Tuscan red and better than I can do it with two coats of Pullman color.

After some further discussion the matter was referred to a special committee of five, who finally reported as follows:

Mr. President and Gentlemen: According to the judgment of your committee the dark colors are the least expensive to maintain, and of those we think Tuscan red is to be preferred. Joseph J. Murphy, Eugene Laing, F. S. Bal Wm. Lewis, F. S. Baldwin.

The report was accepted.



A RUSSIAN COMPOUND PASSENGER ENGINE.

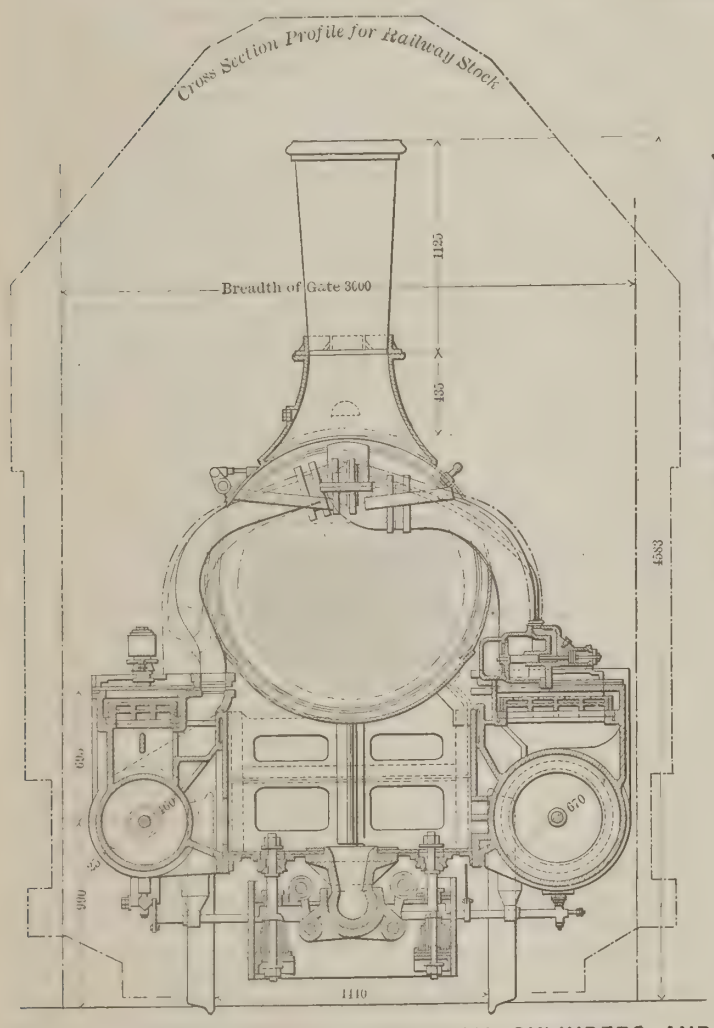


FIG. 1. SECTION THROUGH SMOKEBOX, CYLINDERS AND TRUCK.

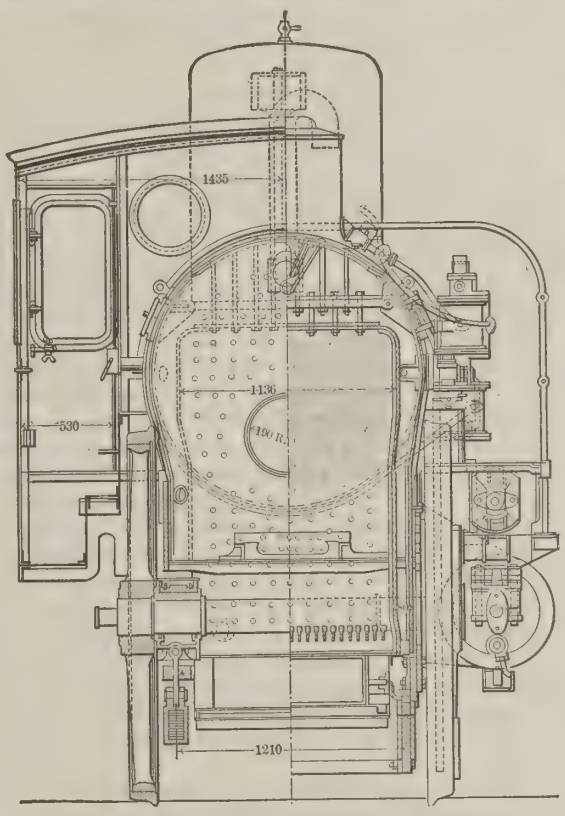


FIG. 2. SECTION THROUGH FIREBOX.

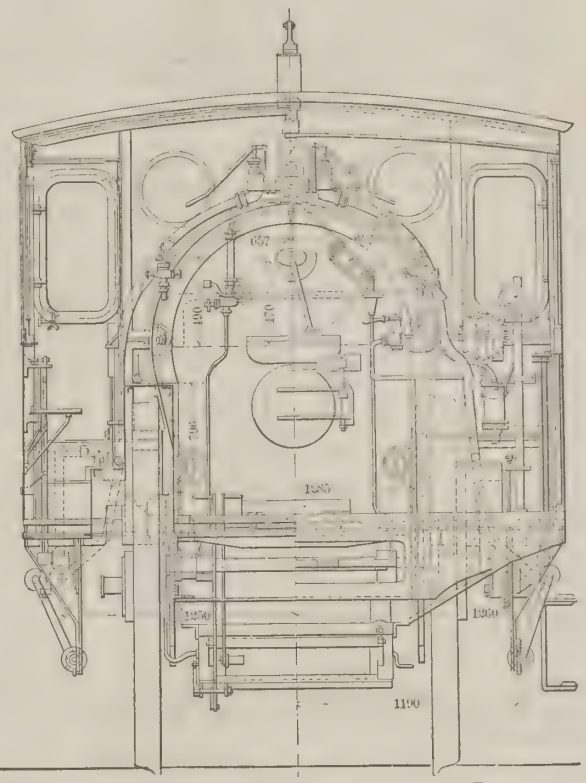


FIG. 3. SECTION THROUGH CAB.

A Russian Compound Passenger Engine.

The accompanying engravings show the general arrangement and some detail drawings of a compound passenger engine built for the St. Petersburg & Warsaw Railway by the Kolomna Engineering Works, at St. Petersburg. The engravings and the substance of the following description are reproduced from *Engineering*. The drawings show very clearly the details of the locomotive. As will be seen it is of the two-cylinder compound type, the high pressure cylinder being 18⅛ inches in diameter, and the low pressure 26⅜ inches. The stroke is 25 9/16 inches. Joy valve gear is used for the steam distribution, the valves being placed on top of the cylinders, as shown in Fig. 1. A Trick valve is used on the low pressure cylinder to obtain the required port opening with a shorter travel of the valve.

The engine illustrated is one of a group of 19 made for fast passenger traffic, and it marks the introduction of an entirely new type on Russian railways. The driving wheels are larger than have hitherto been employed in Russia, and the engine is altogether intended for fast service.

The whole of the front part of the frames is stayed by horizontal plate stays, extending back nearly to the driving axle, in addition to the usual vertical stays, the front end of the engine being thus made very rigid. The cylinders also are fixed to the frames just at the point where they are specially stiffened by the stays carrying the bogie center, as shown in Fig. 1. This figure also shows the construction of the engine truck, which is made of the swing motion type. Owing to the great length of the flues—13 feet 9⅜ inches and the adoption of the long smokebox, now so generally used in American locomotive practice, the front end of the smokebox extends well over the front bogie-wheels, giving the engine a somewhat unusual appearance. The staying of the firebox crown, as shown in Fig 2, is worthy of notice. Over the greater part of its area it is stayed direct to the crown of the firebox casing by screwed stays, but at the front end these stays are not continuous, short stays extending from the firebox crown to a transverse bar, which is in its turn stayed to the crown of the firebox casing by other (intermediate) stays, as shown by the right hand half of Fig. 2. Other transverse stays tie the sides of the firebox casing above the firebox, and compensate for the unbalanced strains thrown upon the shell by the direct stays above mentioned.

The fittings with which the engine is provided include Wenger's automatic brake, speed indicator, steam sanding apparatus, and two whistles, one with a soft tone for use in stations, and the other louder in tone for the open country. The tender has a capacity for 471.6 cubic feet of wood, which is the fuel used in the engine. The tank can hold 13.8 tons of water, which is sufficient for 80 train miles. The following are the principal dimensions of the engine :

General Dimensions:	
Length of locomotive and tender between buffer ends.	57 ft. 3⅜ in.
Length of locomotive alone	34 ft. 5⅛ in.
Distance between leading axle of locomotive and trailing axle of tender	38 ft. 8¼ in.
Distance between driving axles	9 ft. 10 in.
" axles of bogie	7 ft. 6⅜ in.
" driving axle and center of bogie	11 ft. 3¾ in.
Greatest breadth of locomotive	9 ft. 9¼ in.
Distance between frames	4 ft. 2⅛ in.
" centers of bearings of axles	3 ft. 11⅝ in.
" " cylinders	7 ft. 1⅛ in.
Boiler :	
Length without smokebox	21 ft. 11 in.
" of smokebox	4 ft. 11⅛ in.
Diameter of barrel (mean)	4 ft. 6¾ in.
Length of tubes between tube plates	13 ft. 9⅜ in.
Number of tubes	220
Outside diameter of tubes	2 in.
Firebox. Length at top	7 ft. 8⅛ in.
Firebox. Length at bottom	7 ft. 11¼ in.
Firebox. Breadth at top	3 ft. 8¾ in.
Firebox. Breadth at bottom	3 ft. 6⅜ in.
Firebox. Height	5 ft. 9⅛ in.
Heating surface firebox	134.6 sq. ft.
Heating surface tubes (inside)	1,437.4 sq. ft.
Heating surface total	1.572 sq. ft.
Surface of firegrate	26.5 sq. ft.
Steam pressure in boiler (above atmosphere)	165 lbs.
Volume of water in boiler with 4 in. on roof of firebox	160 cub. ft.
Volume of steam space	72.75 "
Height of chimney above rails	17 ft.
" boiler axis above rails	7 ft. 5⅜ in.

Mechanism:

Diameter of high-pressure cylinder	1 ft. 6⅛ in.
" " low " "	2 ft. 2⅜ in.
Stroke of piston	2 ft. 1 1/16 in.
Length of connecting rods	6 ft. 10¾ in.

	High-pressure cylinder.	Low-pressure cylinder.
Ports. Breadth	11 3/16 in.	1 ft. 8½ in.
Ports. Length of steam ports	1 5/16 in.	1 5/16 in.
Ports. Length of exhaust	3⅜ in.	3⅜ in.
Slide valves. Lap outside	1⅛ in.	1⅛ in.
Slide valves. Lap inside	5/32 in.	0 in.
Lead	1/16 in.	1/16 in.
Clearance	13 per cent.	7 per cent.

Wheels and Axles :

Diameter on tread of driving wheels	6 ft. 6 in.
" " bogie "	3 ft. 7¾ in.
" and length of bearings of bogie axles	6½ in. and 10¼ in.
" " " driving axles	7¼ in. and 10¼ in.
Thickness of tires of driving wheels	2 5/16 in.
" " bogie "	2 1/16 in.
Diameter and length of crank pins	4½ in. and 4¾ in.
" " coupling rod bearing of crank pins	5½ in. and 4 in.
Diameter and length of trailing crank pins	3 5/16 in. and 4 in.
" " crosshead pins	3 5/16 in. and 3 in.

Weight :

Weight of locomotive in working order	50.6 tons
Load on each bogie axle	12.3 tons
" " driving axle	13 tons
Weight of locomotive without fuel and water	44.7 tons
Weight of tender in working order	34.5 tons

Winger's Brake.

Brake pressure on each wheel=60 per cent. of load on wheel.

A terrific waterspout occurred Oct. 15 in Nures County, Texas. A territory embracing 400,000 acres of land was flooded to a depth of two feet. The track of the Mexican National road was covered by a sea of water for a distance of 10 miles.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

MRS. HARRISON.

Mrs. Caroline Scott Harrison, wife of the President, died in the White House at Washington, D. C., Oct. 25. Consumption was the malady, and a lingering illness of many weeks partially prepared the President and the nation for the sad ending of a life that was an example of all the virtues of American womanhood.

A live young Master Mechanic, willing to engage for foreign service, may learn of a good opportunity by addressing the Editor.

ECONOMY OF CLOSE NOTCHED QUADRANTS.

On another page we publish a very interesting communication from Mr. R. W. Gray, Master Mechanic of the Southern Pacific road at Tucson, Ariz., on the economical results accomplished by substituting a close notched for a coarse notched quadrant on two locomotives. As Mr. Gray declares, he could no doubt give many other instances showing a like economy resulting from a like simple change.

In one case described in which the particulars are given, three engines of the same build, same dimensions, and in approximately the same general condition, operated a particular run on his division. One of the engines was noticeably harder on coal than its two companions, and in July, 1891, it fell 11.37 miles per ton of coal behind the other two engines doing the same work. At that time the cost of coal on the Southern Pacific averaged $5.25 per ton on the tank. A difference of 11.37 miles per ton of coal was a matter of 6.78 pounds per engine mile, and as the daily mileage was approximately 150 miles, the excess in coal consumption was over half a ton per day, amounting to 15 tons in the month's service, at a cost, in this case, of over $78.

Such little things as this did not use to receive much attention on the Southern Pacific (and do not now receive the attention they should on some roads), but changes that time has wrought have placed men with new ideas, and minds open to receive still newer ones, in authority in its management, with the consequence that matters of detail, small, possibly, when a single instance is considered, but of importance in the aggregate, receive deserved attention and sensible treatment.

In the case under consideration the extravagance of the engine making the poor mileage per ton of coal was quickly noted and the evident cause soundly located. The engine had a common coarse notched reverse-lever quadrant, while its companions making the better mileage were equipped with close notched quadrants, the Southern Pacific standard for which was illustrated on page 87 of the NATIONAL CAR AND LOCOMOTIVE BUILDER for June, 1892. To equalize the conditions under which the engines were operated in this respect a close notched quadrant was substituted for the old quadrant at an expense of ten dollars. Although it was after the middle of the month when the change was made the record shows an improvement for the month's service of 4.38 miles per ton of coal, or 4.99 pounds of coal per engine mile. Allowing the same mileage and cost of coal as in the previous case, this was a saving of 700 pounds of coal per day, and 10.5 tons in the month's service, or $55.

In the following three months this engine averaged 46.83 miles per ton of coal, and its two companions averaged 45.95 miles per ton, a difference in favor of the particular engine noted of .88 mile per ton. As no change had been made in either of the three engines, except the change of quadrants, and as the same men continued to operate the engines on the same run, it is evident that the sudden change of engine 357 from running 11.37 miles less per ton of coal than its companions to running .88 mile per ton more, was due to the improved means of management and regulating the cut-off that the new quadrant afforded.

In the three months following the application of the new quadrant the mileage of the engine per ton of coal was increased over seven miles. This was a saving of 15 per cent., 7.6 pounds per engine mile, and amounted to 17 tons per month, or over $89. In the three months $267 worth of coal was saved, plus the $55 saved during the first half month following the application of the new quadrant, made a total saving of $322 during the quarter that Mr. Gray has favored us with a record of. This was at the rate of $1,288 per year. Rather a good return on the ten dollars which was the cost of the new quadrant.

We have assumed that the improved performance was due to the improved means of regulating the cut-off that the new close notched quadrant afforded. Our own observations and the experience of our correspondent sustain the assumption. He relates that while running an engine two years ago, on regular runs between Sacramento and Oakland, the substitution of a close notched for a coarse notched quadrant facilitated the management of the engine so that its milage per ton of coal was increased six miles. In the case we have considered the fuel mileage was increased a little over seven miles per ton. We fully appreciate how largely this result was due to correct habits of management by the engineer. The improved quadrant could accomplish no economy in the hands of a careless engineer, or one who either from ignorance or prejudice, neglected to avail himself of its aid to regulate the working of his engine to secure the best results. But the fact of special importance is that locomotives equipped with the common type of quadrant with notches spaced an inch or more apart, measuring from center to center of notches, does not allow of such management of the engine as will give the most economical results, and that with such quadrants the engineers must necessarily follow at times, and generally most of the time, the wasteful method of throttling steam.

In a previous discussion of this subject (see issue of June, 1882), we made what was perhaps considered the extravagant assertion that we had seen wide notched quadrants that had in their time been responsible for the waste of their weight in gold by causing unnecessary consumption of coal. In the record of the engine we have here discussed it is shown that, in this case, the rate of difference in value of fuel consumed with a wide notched and close notched quadrant was $1,288 per year, or over 4.7 pounds of gold coin. An ordinary quadrant weighs about 25 pounds. Evidently it would not take very many years at this rate for such a quadrant to cause the waste of its weight in gold of much purer quality than our national coin.

It is interesting to note that in the case we have discussed the substitution of the improved quadrant effected a saving in fuel of 15 per cent., and that this same figure has after many tests been settled upon as representing the average economy of compound locomotives on the Southern Pacific system. While so much thought is bestowed on the improvement of locomotives, and upon means for economizing fuel, it will be well for master mechanics who have not yet done so to carefully consider this matter of quadrants, and if assured of the practicability of the improved type to act without delay. Improving the plain locomotive is not antagonizing the compound. It is simply our duty to do the best we can with what we have; and in this connection it is well to remember that the extra cost of one compound locomotive will equip between 70 and 100 engines with close notched quadrants.

THE MASTER CAR AND LOCOMOTIVE PAINTERS' CONVENTION.

We devote considerable space in this issue to reports that were read and discussed at the late convention of the Master Car and Locomotive Painters' Association. Painting, and cleaning paint work, does not usually enter very largely into the expense of the maintenance of locomotives, but with passenger cars it does cut quite a figure, both in the expense of maintenance and in the appearance of the cars individually, and of the train service as a whole.

The discussions gave expression to the fast growing sentiment in favor of the Pullman color for the outside of passenger car bodies among railroad men generally, and the indorsement of Tuscan red was of the nature of a compromise between the advocates of light and dark colors. Sentiment, simply, fosters and adopts what is popularly known as fads; but in this case the growing sentiment in favor of the Pullman color that we speak of is one founded on good reasons and the hardest kind of sense. Cheapness in first cost of painting, cheapness in preserving and keeping clean, ease in matching when repairs are made, durability, and the attribute of concealing instead of revealing cracks when they occur in the painting, are the qualities of the Pullman color that are making it popular, and are the reasons for the sentiment in its favor mentioned. Also the modern educated taste favors the serviceable both in the appearance and the construction of railroad rolling stock, rather than gaudy show.

The best color for passenger cars has been a mooted question for a long time in a good many parts of the world, and there is no probability that there will ever be anything like uniformity in the color of such cars except in certain countries or localities. North American railroads are progressing toward a dark color; but while this color has much to recommend it, as mentioned, and is probably the coming color for cars in this country and will probably give all the satisfaction expected of it, especially to Northern roads, it does not follow that it is the best color for cars everywhere. In warm or tropical countries it is probable that, eventually, the lighter colors, perhaps even white, will be found to be the most desirable for reasons quite remote from cheapness in application or economy in maintenance, or even appearance. In such countries personal comfort depends very largely upon the temperature one is subjected to, and the almost constant effort is to keep cool. The houses are built and nearly everything is arranged with this object in view. In India the matter of the color of the outside of passenger cars and its effect on the temperature of the cars, and the comfort of the occupants is just now receiving a good deal of attention. Commenting on the matter, the *Indian Engineer* recently said that one simple means of keeping down the temperature of cars has been neglected in a manner that seems difficult to explain. Although white is known to be the color that resists most effectually the heat of the sun, it is the color the least used on the exterior of railway cars; although black, and the darker shades of brown and gray are known to absorb the most heat, they are largely used on the roofs and sides. There is a steady increase of heat absorbing power in all the colors extending from white to black, which absorbs more than twice as much heat as white. In northern sections where such conditions do not exist the railroads are free to adopt colors that economy and service recommend, but in southern and tropical sections the comfort of the patrons of the roads may demand light colors.

In declaring the piece-work system practicable in all railroad paint shops the association took another step ahead, and in the line of celerity and economy in the production of work. The introduction of the system in any kind of a shop is an arduous undertaking for the man in charge, as there are nearly always local conditions that require modifications in the system and in the schedules of pay, so that the problem must be worked out in a large degree by each employer adopting it. But where it is adopted and properly adapted to the conditions of a shop, it is, generally speaking, unequaled as a means of reducing the cost of work, increasing the capacity of the shop, and regulating the supposed or real grievance of labor. The tenor of the reports and discussions at this convention shows a good deal of zeal on the part of the members to profit as much as possible by the interchange of thought and experience, and to arrive at correct conclusions that would best advance their work and the interests of the roads they serve. A good deal of encouragement ought to be given to the work of the association by motive power and car department officials, as there can be no doubt that its tendency will be to materially improve paint shop methods, and enhance the economy, quality and durability of the work in which its members are engaged.

AIR BRAKES ON THE NEW YORK CENTRAL.

The New York Central & Hudson River road devotes two of its four tracks to passenger and fast freight trains, and the other two to slow freight trains. Early in the present year the management decided not to allow any cars equipped with air brakes other than the Westinghouse to run in its fast trains with such brakes in operation, and instructions were issued accordingly. They have been adhered to until quite recently, when tests of the New York air brake at Albany, September 8, 9 and 10, demonstrated to the satisfaction of the management that this brake was perfectly safe to be operated in its trains. We publish a letter from Mr. Webb, Third Vice-President of the New York Central, on the subject in this issue

DISGRACEFUL STRIKES.

The year 1892 has had a little more than its share of labor disturbances in this country that have attracted the attention and unfavorable comment of the world. October, 1892, will go into history as witnessing at least two of the most silly and unreasonable railroad strikes that have ever occurred. The large strikes that took place during the summer months, and the lawless behavior of the men engaged in them, did not leave the public with the most kind and tolerant feelings for men who do not hesitate to disturb the peace and commercial prosperity of the country to settle real or imaginary personal grievances. This has had the effect of making the reception of later follies less patient, and of prompting queries as to how long this state of things should be allowed to continue.

About the middle of the month a telegraph operator on the Atchison, Topeka & Santa Fe sent a message "as a joke" to the other 2,000 operators on the lines of that system ordering an immediate strike, and without any authority to do so, signed the name of the Chief of the Order of Railway Telegraphers to the order. Although no excuse or cause existed for striking, and although a contract existed between the operators and the company to the effect that thirty days' notice should be given by either party desiring a change; yet they all struck on receipt of the bogus order; and ten hours elapsed before they could be induced to return to work even by dispatches from their genuine chief.

The other case is described in the circular issued by the President of the Denver & Rio Grande road, published on another page. A bulletin board order to the effect that two specially important trains must make time and not be delayed at stations for employes to eat meals arouses the ire of men spoilt by kind treatment, and one declaring he will not take out his train unless the objectionable order is removed so he can stop and eat at leisure, is sustained in his insubordination by practically all the engineers and firemen and conductors and brakemen on that division of the road; and a strike without any warning to the company or effort to settle the matter with the proper officers follows. Indeed, the invitation to meet the General Superintendent of the road and discuss the matter, or refer it to arbitration, was spurned. For over three days trains were not run on that division, and the railroad company and the commercial interests of the community suffered great inconvenience and immeasurable losses in consequence.

Whoever may find himself capable of regarding with charity the folly of the striking operators on the Santa Fe in obedience to the supposed command of the head of their organization, few sensible men will be able to regard the strikers on the Denver & Rio Grande with any other sentiment than disgust.

They had no just grievance, and violated every common rule of courtesy to their employers, their duty to the public, and the laws of their respective organizations. Their conduct was disgraceful not only to themselves, but to their unions, and harmful beyond measure to the welfare of railroad employes in particular and workingmen in general. The *Railway Review* truly says: "No man nor set of men can inflict an injury upon these strikers which is in any way comparable to the injury which they inflict upon themselves by such a course—a course which if much longer indulged in will be resisted by those people who are the greater sufferers from their action, and who will insist upon immediate and effective relief at the hands of our law makers; and no one who has followed the course of special legislation in this country, but what knows that under the pressure of such a demand equity would not be accomplished, but that the burdens of railway service which are now sufficiently unequal and oppressive to the employes as a whole to demand careful consideration would be many times multiplied."

It is greatly to the credit of the officers of the Denver & Rio Grande that being thus suddenly confronted with a serious strike that practically disabled the road they immediately took and kept a position of firmness toward the men, insisting that work must be resumed before any consideration of grievances could be given. In such an arbitrary and unreasonable strike summary dismissal from the company's service is what every man involved in it deserved.

TESTS OF THE PURDUE LOCOMOTIVE.

An interesting series of tests of the locomotive in the laboratory of the Purdue University is reported on another page in this issue. While they are but preliminary tests, conducted with new appliances and by rather inexperienced attendants, and, therefore, lack accuracy and the value it gives, they yet illustrate some of the advantages of making such tests, and indicate the thoroughness with which they are likely to be carried out after all the conditions are mastered. As mentioned in the report the tests were made to determine the most economical point of cut-off, and in the five tests made the engine was worked at cut-offs of 12.5 inches, 10.7 inches, 9 inches, 6.8 inches, and 5.1 inches, respectively; in each case for a period of about three hours and for a distance, practically, of about 45 miles. It was designed to maintain throughout the tests a uniform speed and pull on the draw bar, throttling the steam as was necessary to do this.

A diagram appears in the report showing the steam consumption as measured by an indicator, and by actual measurement of the water furnished the boiler. While the line showing the indicator measurement indicates a steady decrease of steam consumption with shorter cut-offs, the line showing the water measurement indicates a rather surprising amount of cylinder condensation with cut-offs less than 8 inches, so much so that the steam consumption rapidly increased, and so far as this is considered as the criterion of measurement the economy of the engine decreased.

If another diagram had been constructed showing the fuel consumption, which is the real matter of importance, it would have shown that, notwithstanding the rapid increase of steam consumption with the very short cut-offs, the fuel consumption continued to decrease. Taking tests 4 and 5, in which the shortest cut-offs, 6.8 inches and 5.1 inches, respectively, were used, and we find that with the short cut-off 36.35 pounds of coal were used per mile, and with the long cut-off 37.12 pounds were used per mile, a difference in favor of the short cut-off of .77 pound per mile. Truly, not very much, and we are free to say surprisingly small; so much so, indeed, that we are inclined to believe that the faulty adjustment of the dynamometer discovered near the end of the tests resulted in the engine being made to do more work with the short than with the late cut-off here compared. As stated by Prof. Goss it was not expected these early trials would be of value outside of the laboratory, and we have no doubt the tests that will be made under perfect conditions, and the improved management experience will teach, will show an economy of fuel for the short cut-offs approaching that observed in practice.

The Mexican practice of arresting the engineers and firemen when a railroad accident occurs in which some one is injured is well known. The same practice existed in Ireland also until recently. The Irish police are now by a late ministeral order directed to exercise discretion in the arrest of runners and firemen in case of accident, and to make no arrests when there is no apparent blame.

A very large number of the fatalities on railroads is caused by circumstances beyond the control of enginemen, and the practice in any country of invariably throwing these men into prison until their innocence of blame is proved is such a glaring injustice that it is surprising it could ever have been inaugurated or continued in a civilized country. Its ultimate effect cannot be otherwise than to lower the efficiency of the service by driving capable and self-respecting men from it.

Books Received.

Report of Proceedings of the Master Car Builders' Association, 1892. Illustrated. Pages 315. Price $1.50 Chicago. J. W. Cloud, Secretary, 947 Rookery Building.

This is the official publication of the proceedings of the Master Car Builders' Association Convention held at Saratoga in June. A synopsis of the matter contained in the book was published in the July and August issues of the NATIONAL CAR AND LOCOMOTIVE BUILDER, and in other railroad papers. In the report, however, all the standards of the Association are illustrated, and the discussions on the different subjects are given nearly in full, and the whole matter is in compact form for preservation and reference.

Poor's Directory of Railway Officials and Manual of American Street Railways for 1892. 590 pages. Price, $3.00. New York: H. V. & H. W. Poor, No. 70 Wall Street.

This publication has just been received from the bindery. It is much increased in size and much improved in general character over previous editions. An entirely new feature of the book is a directory of Directors of railroad companies, which will no doubt be much appreciated. The statements of street railroads have been very much elaborated in this number of the book, and for most of the leading companies they are now given in as much detail as the statements of the steam railroads are given in the Manual. On pages 433 to 471 is a complete list of all railroads projected or now under construction in the country, in which are given all the important points desired to be known by manufacturers or dealers in railway materials, as well as by the general public.

Report of the Proceedings American Railway Master Mechanics' Association, 1892. 255 pages. Illustrated. Price $1.50. New York. Angus Sinclair, Secretary, 212 Temple Court.

This is the official report of the proceedings of the twenty-fifth annual convention of the American Railway Master Mechanics' Association, held at Saratoga, N. Y., in June last. It appears in a new dress this year. A synopsis of the proceedings was published in our issues of July and August following. In the Report the reports of committees is given in full and the discussions relating thereto. A large portion of the book is taken up by the lengthy report on Compound Locomotives. As usual the standards of the Association are illustrated, and the names and addresses of members given.

Bulletin No. 32. Bureau of the American Republics. Guatemala. Illustrated. Pages 188. Washington, D. C., No. 2 Lafayette Square.

Following the plan of the former valuable and interesting bulletins of this important Bureau of the Government, Bulletin No. 32 gives an historical review and geographical sketch of the country it describes—Guatemala. It gives the population and describes the political divisions, constitution and form of government, agricultural and mineral resources, commerce and commercial advantages, and transportation facilities; and much other information of interest and value from a manufacturing and commercial view, as well as to all interested in our South American neighbors.

The Reading Takes Control of the Boston & Maine.

As we go to press it is announced that the Philadelphia & Reading has absorbed the Boston & Maine. This resulted Oct. 26 in the resignation of William T. Hart, a director of the Boston & Maine. The vacancy was filled by the election of Archibald A. McLeod, President of the Philadelphia & Reading Railroad. President Frank Jones, of the Boston & Maine Railroad, then tendered his resignation and Mr. McLeod was unanimously elected to the Presidency of that corporation.

The position of the chairman of the board of directors was created, and Mr. Jones was chosen that official, being charged with the executive management of the Boston & Maine system, as heretofore. He was also chosen Vice-President.

The Reading road and allied lines will distribute its enormous merchandise and coal traffic into New England over the Boston & Maine system. Boston will be made the center of its distribution.

Japanese Temple at Chicago.

About 20 Japanese workmen in native costume are now busy on the Japanese Building, at the World's Fair grounds.

The entire building will be over 200 feet long and will follow the general ground plan of the original Hoodoo, which is one of the most famous historical temples of Japan. The original Hoodoo was built in the noted tea plantation district of Ugi 842 years ago.

The structure will cost approximately $60,000, and surrounding it will be Japanese landscape gardening, carried out at the expense of an additional $12,000. The temple will be devoted to art and ethnological exhibits of Japan. It will be a permanent structure and at the close of the fair will become the property of the South Park Board of Commissioners. Japan was the first foreign Government to make a big appropriation for the fair. The sum set apart by the Government of the Mikado approximates $630,000.

Tools of the Pyramid Builders.

A two years' study at Gizeh has convinced Mr. Flinders Petrie that the Egyptian stone workers of 4,000 years ago had a surprising acquaintance with what have been considered modern tools. Among the many tools used by the pyramid builders were both solid and tubular drills and straight and circular saws. The drills, like those of to-day, were set with jewels (probably corundum, as the diamond was very scarce), and even lathe tools had such cutting edges. So remarkable was the quality of the tubular drills and the skill of the workmen that the cutting marks in hard granite give no indication of wear of the tool, while a cut of a tenth of an inch was made in the hardest rock at each revolution and a hole through both the hardest and softest material was bored perfectly smooth and uniform throughout. Of the material and method of making the tools nothing is known.

The members of the National Guard of Pennsylvania who have been on duty at Homestead for more than three months past were discharged from service Oct. 18, and affairs at that place are now in complete charge of deputy sheriffs under control of the Sheriff of Pittsburgh. The soldiers were on duty at Homestead 95 days, which is the longest time that the National Guard of Pennsylvania has ever been in service since its organization. It is stated that the placing of troops at Homestead will cost the State of Pennsylvania about $600,000 after all expenses have been paid.

The regulations concerning the hours of service of French locomotive runners and firemen have been recently revised as follows:

1. The spell of work must come between two periods of uninterrupted rest of at least 10 hours each in such a way that no period of 24 hours reckoned either from the beginning of the work or of the rest shall contain more than 12 hours of work, or less than 10 hours of unbroken rest.

2. All time when the men are on the engine or in or about the sheds shall count as work.

3. The period of 12 hours of work is a maximum limit which must not be attained generally, especially with passenger trains.

In all cases where the maximum is exceeded it must be reported, and police prosecutions may follow.

Personal.

Mr. C. J. Williams, Master Mechanic of the Communipaw shops of the Central of New Jersey, has resigned.

Mr. M. M. Dodd has been appointed Road Foreman of Engines and Air Brake Instructor of the Seaboard Air Line.

Mr. A. D. Smith, General Freight and Passenger Agent of the Cornwall & Lebanon Railroad, has been appointed General Superintendent.

Mr. C. M. Lawler has been appointed Assistant General Manager of the Philadelphia & Reading Railroad, with office at Philadelphia, Pa.

Mr. Geo. P. Fravel has been appointed Assistant Master Mechanic of the Indianapolis shops of the Pittsburgh, Cincinnati, Chicago & St. Louis.

Mr. John E. Wiggan, an old railroad Master Mechanic, well known throughout the south and west, died Sept. 8 at Centre Harbor, N. H., aged 73.

Mr. E. Dawson has been appointed Master Mechanic of the Fremont, Elkhorn & Missouri Valley road, with headquarters at Missouri Valley, Ia.

Mr. George B. Ross, Master Mechanic of the New York, Lake Erie & Western at East Buffalo, is reported to have resigned on account of ill health.

Mr. W. H. Meany has been appointed to succeed Mr. J. L. Williams, resigned, as Superintendent of the San Luis division of the Mexican National.

Mr. George W. Buck has been appointed Master Mechanic of the Fergus Falls and Breckenridge divisions of the Great Northern, with headquarters at St. Paul.

Gen. Greenville M. Dodge has resigned as President of the Union Pacific, Denver & Gulf, and has been succeeded by Mr. S. H. H. Clark, President of the Union Pacific.

Mr. Day K. Smith has resigned as Superintendent of the Kansas City Belt Railway to accept the position of Superintendent of the Duluth Transfer Railway, at Duluth, Minn.

Mr. Thomas A. Lawes, Master Mechanic at Huntington, Ind., of the Chicago & Erie, has resigned, and his position has been filled by the appointment of Mr. John Hawthorne.

Mr. Leonard W. Squire has been appointed Purchasing Agent of the Cleveland, Lorain & Wheeling in addition to his duties as Chief Clerk to the Superintendent and Master Mechanic.

Mr. W. J. Matthews, Superintendent of Transportation of the Savannah, Americus & Montgomery Railroad, has been appointed General Superintendent, with headquarters at Americus, Ga.

Mr. C. V. Lary has been appointed Master Mechanic of the Kansas City, Osceola & Southern in charge of machinery and car departments, vice Mr. W. E. Reeve, resigned on account of poor health.

The San Antonio & Aransas Pass Company has created the new office of Assistant General Manager, to which Mr. Charles B. Peck, of Chicago, has been appointed, with headquarters at San Antonio, Tex.

Mr. D. W. Rider, late General Superintendent of the Jacksonville South-Eastern, has been appointed Superintendent of the Kansas City Belt Railway at Kansas City, Mo., to succeed Mr. Day K. Smith.

Paymaster Ira A. McCormic, of the Hall Automatic Signal Company, of Chicago, has resigned to accept the position of Trainmaster on the Lake Shore & Michigan Southern between Buffalo and Cleveland.

President J. H. Wickes, of the Wickes Refrigerator Car Company, met with a fatal accident at Detroit on the evening of Sept. 23. He fell upon a stone sidewalk, fracturing his skull. He leaves a widow and two sons.

Mr. A. M. Waitt, heretofore Assistant General Master Car Builder of the Lake Shore & Michigan Southern, has been appointed General Master Car Builder of that road, with headquarters at Cleveland, O., to succeed Mr. John Kirby.

Mr. W. V. S. Thorne has resigned the superintendency of the St. Cloud shops of the Great Northern, and Mr. E. A. Westcott, formerly Division Master Car Builder of the Chicago, Milwaukee & St. Paul at Minneapolis, has been appointed to succeed him.

Mr. Wm. Wiehl, for about ten years President of the Amalgamated Association of Iron and Steel Workers, of Pittsburgh, but who will sever his connection with that organization on Nov. 1, has decided to connect himself with the Oliver Iron and Steel Company of Pittsburgh.

Mr. John M. Sullivan, a foreman in the employ of the Richmond Locomotive Works, died at his home, Richmond, Va., a few days ago. Mr. Sullivan had been in the employ of the works for 20 years, and previous to that time was Master Mechanic of the Wilmington & Delaware road. He was one of the best known mechanics in the South.

The Carnegie Steel Company, Limited, issued a circular Oct. 18 announcing the resignation of Mr. John A. Potter as General Superintendent of the Homestead mills and his appointment as Chief Mechanical Engineer.

Mr. Charles M. Schwab, General Superintendent of the Edgar Thomson plant will succeed Mr. Potter at Homestead.

Mr. J. S. Chambers has been appointed Master Mechanic of the St. Joseph Terminal Company, with headquarters at St. Joseph, Mo. Mr. Chambers has charge of the terminal shops, owned jointly by the St. Joseph & Grand Island and the Santa Fe roads. Within four years he has been promoted from night roundhouse foreman to Master Mechanic.

Mr. J. T. Robinson, who has been Master Mechanic of the Mobile & Birmingham at Mobile, Ala., has been appointed Master Mechanic of the East Tennessee, Virginia & Georgia, with headquarters at Macon, Ga. The employés of the Mobile office presented him with a handsome gold-headed silk umbrella and a seal ring, while the engineers and firemen gave him a silver water service.

Mr. John Kirby, ex-President of the Master Car Builders' Association, and who, for the last 34 years, has been General Master Car Builder of the Michigan Southern & Northern Indiana Railroad and of the Lake Shore & Michigan Southern, has retired from that position. Mr. Kirby continues in the services of the company, and will have supervision of the construction of new cars built by contract.

Mr. C. E. Fuller, Jr., Master Mechanic of the New York, Lake Erie & Western, at Jersey City, has resigned to accept the position of Superintendent of Motive Power of the Central Vermont, with headquarters at St. Albans, Vt. On retiring from office the employés under Mr. Fuller gave him a supper and presented him with a handsome testimonial, signed by all the men in the motive power department on the division.

Mr. J. F. Barnard has retired from the position of President and General Manager of the Ohio & Mississippi, his successor having been chosen at the annual meeting, Oct. 12. Mr. Barnard has been in the railway service since 1850 and was chosen President and General Manager of the Ohio & Mississippi in 1886, before which date he was General Manager of the Hannibal & St. Joseph and Kansas City, St. Joseph & Council Bluffs.

Mr. George Gramling died at his home in Charleston, S. C., recently, after a lingering illness of some weeks' duration. For many years Mr. Gramling was Master Car Builder of the South Carolina Railway. He went to Charleston about twelve years ago from Atlanta, in which city he had been connected with the Air Line road of the Richmond & Danville system. He has many friends who will deeply regret his sad death.

Mr. George Barnes, a leading business man of Syracuse, N. Y., died recently at the Fifth Avenue Hotel, New York. of pneumonia, contracted on the steamer coming from Europe, where he had been spending some time in the hope of recuperating his health. The deceased was born Oct. 1, 1827, in Kent County, England, and came to this country in 1841, taking up his residence in Syracuse. He studied law, learned the mason's trade, served in different capacities as a railroad employé, and was finally appointed Snperintendent of the Utica & Syracuse Division of the New York Central Railroad at the age of 26 years. Later he engaged in different commercial pursuits, and at his death was head of the Whitman & Barnes Mfg. Co., of Syracuse, N. Y.

New England Railroad Club.

The regular meeting of the club will be held at the United States Hotel, Boston, Wednesday, Nov. 9, 1892, at 7:30 P. M. The subject for discussion, viz., "Higher Speed of Railway Trains; System and Appliances Necessary to Accomplish It," will be opened by Mr. C. A. McAlpine, Superintendent Northern division Old Colony R. R.

Mr. J. B. Barnes, Superintendent of Motive Power and Machinery of the Wabash, has given directions that the quadrants of the 25 engines for the road in course of construction at the Rhode Island Locomotive Works are to be notched on each side of the center to effect a cut-off of 4½ inches, and the full length of quadrant to be notched ⅝ inches apart. This is in view of adopting a standard close notched quadrant for all Wabash engines. Mr. Barnes has always been keenly alive to the importance of fuel economy, and we predict he will not be disappointed with the result of this latest move in that direction.

Jay Gould will loan to the Bureau of Floriculture of the World's Fair a plant 34 feet high. He has a number of corporation plants that also come very high, but loans on these are conducted differently.

Stratford Shops of the Great Eastern Railway.

The shops of the Great Eastern Railway at Stratford are described in a recent issue of *Invention*, from which we take the following:

The works were opened in the year 1847, and now occupy a total area of 52 acres, of which the shops alone cover 13. The number of hands employed at these works is about 4,800. The rolling stock consists of about 546 tender engines, 357 tank engines, 3,785 carriages, 16,118 wagons and 925 road vans, which are renewed and kept in repair mainly at these works. The whole of the new stock, averaging 1½ engines, 6 carriages and 14 wagons per week, is also now built at the Stratford works; 1,260 carriages are lighted by compressed oil gas, and all engines and carriages used for passenger trains are fitted with the Westinghouse automatic air brake. The erecting shop is 348 feet by 142 feet. It has four bays; the two centre ones are used for erecting purposes, and 50 engines can be in hand at the same time. Here will be seen some new four-wheel, coupled, mixed-traffic engines in course of erection. It was in this shop that a locomotive of the goods-engine type was recently built in 10 working hours, being commenced at 9 A. M. on December 10, and turned out at 9:15 A. M. on December 11, 1891. There are four 30-ton and one 15-ton overhead traveling cranes, worked by flying ropes, traveling at a velocity of 2,200 feet per minute, also four 3-ton hand cranes. The main portion of the drilling on the pits is done by "Stow" flexible shafts. There are also portable machines for cutting off tube ends, boring and facing cylinders, facing slide-valve faces, dome tops and tapping stay holes. All these machines were seen at work. The two side bays are used for fitting purposes, boiler mounting, and for heavy machinery, including a frame slotting machine, radial drills, planing machines, cylinder-boring machines, and a vertical milling machine, all of which are continually at work. In one corner of this shop is a 50-ton testing machine, fitted with Wickstead's patent self-recording apparatus, which gives stress diagrams of the tests. Bending compression and tensile tests are here made of boiler and frame plates, etc., and records kept. Above the south bay is a floor containing the pattern shop, the chemical laboratory, and the works manager's drawing office, in the latter of which is a model motion for experimentally setting out and determining the motion of different classes of engines. In the laboratory tests are made for determining the constituents of iron, steel and other materials, the calorific value of coal and oil, the properties of water, etc. Above the north bay is a shop in which Westinghouse brake work is fitted up and repaired, and there are also brass finishers, etc., working here. In the machine shop, which is 144 feet by 138 feet, there are 189 machines, comprising lathes, planing, slotting, shaping, drilling and milling machines, the latter being a special feature. "Twist" drills are mainly used throughout the establishment, and can here be seen in process of manufacture. In the iron foundry there are three cupolas, two of about three tons capacity each and one of seven tons. There are two overhead traveling cranes, one 15-ton hand gear and one 10-ton, driven by a shaft running the full length of the shop. About 40 tons of castings are turned out per week. The brass foundry and coppersmiths' shop adjoin the iron foundry. In the boiler shop there are six overhead traveling cranes, driven by flying ropes. The greater portion of the riveting is done by means of two fixed and four portable hydraulic riveters, worked by special pumps and accumulators, two of the portable riveters being specially designed for foundation and firehole rings. A large punching press for engine frame plates, 1⅛ inches thick, was seen at work; also horizontal and vertical plate bending rolls. In the smithy will be seen the forging of the various parts required in a locomotive; also machines for making rivets, bolts and nuts. In the wheel shop there are two powerful hydraulic presses for pressing the wheels on and off the axles. These are worked by pumps, which give a pressure on the ram of 200 tons. The various processes of turning and slotting the wheels, tires, axles and crank axles were seen in action, including six lathes with 9-foot face plates. In the carriage department were seen in course of construction 4 first class saloons and 30 third class suburban carriages, and in the saw-mills some of the best and most improved machinery for cutting up, planing, molding and preparing the wood ready for the use of the carriage and van builders. There are also machine, fitting and smith shops in this department. The wagon department also has extensive saw-mills, and in the wagon shop were seen about 30 10-ton coal wagons and 13 cattle boxes in course of construction. Near here is a shop for the manufacture and repairs of carriage and wagon wheels.

The plan of the Washington & Baltimore Boulevard and Electric Railroad to run between Baltimore and Washington have been completed. The electric road will be constructed with a double track and will be stone ballasted. Its construction will admit of the running of cars or trains at a rate of 60 miles an hour, which, it is thought, will furnish the rapid transit service necessary between the two cities and the intervening towns. The boulevard is to be patterned after the one between St. Paul and Minneapolis.

The annual meeting of the American Society of Mechanical Engineers occurs in New York City Nov. 14 to 18.

Communications.

Fuel Saving Effected by Close-Notched Quadrants.

Editor National Car and Locomotive Builder:

I have been an interested observer of the crusade of the NATIONAL CAR AND LOCOMOTIVE BUILDER against the common wide notched reverse lever quadrant and its advocacy of the speedy adoption of fine or close-notched quadrants to allow of a finer graduation of the cut-off. In connection with this matter the following facts may be of interest: A year ago three Roger engines, Nos. 357, 358 and 359, respectively, operated exclusively a certain run on the Tucson division of the Southern Pacific road. In July, 1891, the mileage per ton of coal of engines 357, 358 and 359 on the same run was 39.76, 46.43 and 45.84 respectively.

The only noticeable difference in the engines was that the two engines making the best mileage had fine notched quadrants, and the one making the poorest mileage had an ordinary coarse notched quadrant. Believing the trouble was not in the men, but in the means of regulating the cut-off, I applied our standard close notched quadrant to engine 357 on Aug. 17, and an immediate improvement was noticeable.

The record for July and the following four months, during which time the three engines remained on the same run, was as follows:

	Eng. 357. Miles per ton of coal.	Eng. 358. Miles per ton of coal.	Eng. 359. Miles per ton of coal.
July	39.76	46.43	45.84
Aug	44.14	50.47	47.79
Sept	47.32	47.32	48.94
Oct	47.48	45.40	43.31
Nov	45.71	45.71	45.07

This went to show that the trouble was not in the men, and on further investigation I found that engine 357 was running with ¾-inch outside lap while the others had ⅞-inch, and before the valves were changed the fine-notched quadrant brought engine 357 right up in line with the others.

I could, if I had the time, give you many other instances since I have been putting these quadrants on, showing that in every case they have proved a saving in fuel; but I will only add my own trial of one which was, I believe, what first called special attention on the Southern Pacific to this matter. In 1890 I was running engine 1003 between Sacramento and Oakland, on the Central Pacific Overland trains 1, 2, 3 and 4. This engine was a Cooke 18 × 24, 62 inch wheels, and carrying 160 pounds of steam pressure. The average trains were not heavy for her. The quadrant was very coarse, the notches being 1½ inches from centre to centre. She would not make time with lever hooked in first notch, and in the second she worked so strong that I had to throttle her badly. Mr. A. D. Kilborn was running engine 1001 on the same run, and for months there was not a mile of difference in our monthly coal records.

On June 1, 1890, a fine notched quadrant was put on my engine and there was an immediate gain of six miles per ton of coal over the mileage of 1001; and as near as I can remember it averaged about that until I left the engine.

I quite agree with you that it requires the co-operarion of the engineer, and unless used intelligently does not show up so well; although with our present standard quadrant there is absolutely no "chatter" to the latch and its having three faces instead of one to wear against, they will last far longer than the ordinary single latch.

We are favored on this road in having a class of engineers who have entered heartily into the matter of economizing fuel, and there is a quiet but steady improvement in the mileage.

R. W. GRAY, Div. M. M. S. P. Co.

TUCSON, Ariz., Oct. 12.

Air Brakes on the New York Central.

Editor National Car and Locomotive Builder:

We would like to have you publish the inclosed letter as the result of the brake trials made by the New York Central in Albany on Sept. 8, 9 and 10. Mr. Webb gave us this letter with full permission to publish the same.

You will notice that these reports place the two brakes on an equal footing in every respect.

Yours truly,

C. A. STARBUCH, Vice-President.

NEW YORK CENTRAL AND HUDSON RIVER RAILROAD COMPANY,
GRAND CENTRAL DEPOT,
NEW YORK, Sept. 26, 1892.

H. Walter Webb,
Third Vice-President.

Mr. Royal C. Vilas, President New York Air Brake Company, 115 Broadway, N. Y.

DEAR SIR: Replying to your letter of last week, I would state that a full and detailed report from Mr. Dudley on the tests recently made by us of your automatic quick acting brakes, will not be ready until some time in October.

I have, however, a preliminary report from Mr. Dudley, and also reports from Mr. Voorhees, our General Superintendent, and Mr. Buchanan, our Superintendent of Motive Power and Rolling Stock, both of whom were present at the tests.

The gist of these reports is that, from a practical operating standpoint, there is no difference between the operation of the Westinghouse air brakes and the air brakes of the New York Air Brake Co., and the tests where the cars in the train were mixed, a portion being equipped with the brakes of one company and a portion with the other, showed as good results as when either brake was used separately.

We are satisfied that there are no practical objections to allowing the cars equipped with the New York brake to be used in conjunction with those equipped with the Westinghouse brake.

I have, therefore, issued orders removing all restrictions as to the use of cars equipped with your brakes; and, hereafter, cars so equipped will be received and operated by this company and treated precisely the same as the cars equipped with the Westinghouse brake.

Yours very truly,

H. WALTER WEBB, Third Vice-President.

Jerome vs. U. S. Metallic Packing.

Editor National Car and Locomotive Builder:

I desire to inform you that I have commenced suit against the United States Metallic Packing Company, of Philadelphia, and their representative, Mr. E. D. Hurley, for $100,000 damages. The cause of the suit is as follows:

As you, no doubt, are aware, the twenty compound engines furnished the Elevated Railroad here were equipped with the United States packing. It gave the company trouble from the start, and in fact several of the engines had to be laid up at different times on account of the packing giving out; the annoyance finally became so great that Mr. Vauclain, the inventor of the engine, sent for me, and as a result of our conversation he ordered five sets of the Jerome packing to be applied to engines on which the United States had failed to work. Shortly after the first set of my packing was applied I learned that the agent of the United States packing was offering large sums of money to certain parties to have my packing destroyed by the use of emery or otherwise. On looking further into the matter I obtained positive proof that the rumor was correct; hence the suit. I have known of the same thing being done on several different roads where my packing was used, but could never get proof enough to bring the guilty parties to justice till now.

C. C. JEROME.

"Railway Car Construction."

(From the American Machinist.)

This book gives evidence of the author's thorough practical knowledge of car construction, and his ability of stating the subject in a clear and comprehensive manner. It treats on the construction of all classes of passenger and freight cars, including their trucks and attachments, and is elucidated by many fine detail scale drawings of car bodies, framing, floors, doors, trucks, etc., and in addition to these complete general plans of cars are given; these are reproductions of working drawings contributed by railway and car companies. The matter was originally published in the NATIONAL CAR AND LOCOMOTIVE BUILDER, with the intention of publishing it in book form, and as now published it forms a book exceedingly handy for reference, containing much useful, valuable and practical information for all those engaged in building cars or in any way interested in this subject. The publisher has added drawings of all the standards adopted by the Master Car Builders and Master Mechanics' Associations. The book should be in the hands of every engineer, draftsman or artisan engaged in this line of business. It is published by R. M. Van Arsdale, NATIONAL CAR AND LOCOMOTIVE BUILDER, Morse Building, New York. Price, $3.

Loss of Gold in Manufacturing.

When the American Waltham Watch Company moved to new quarters in May last, they left behind a snug fortune in their old buildings in the shape of minute particles of gold among the old rubbish and in the cracks of the pine flooring. The precious metal has been reclaimed, however, by the Irvington Smelting and Refining Works, at Irvington, N. J., in the form of bars of gold. The total value of the gold reclaimed is between $65,000 and $67,000. The gold recovery must have accumulated since 1879, when the factory was occupied by the firm. An average of 350 gold watch cases were turned out every day, each case weighing from twenty to fifty pennyweights. The gold was valued at eighty cents a pennyweight, and during a year it was estimated that more than $500,000 worth of gold was used in the manufacture of watch cases.

The water in which the workmen washed their hands, the mats on which they walked, and the towels with which they dried their hands and faces were carefully preserved, and at the end of every month were strained or burned and the residue afterward smelted and refined. About $1,000 a month was saved in this manner. Every summer parts of the flooring were taken up and smelted, and sometimes as much as $7,000 was realized in this way.

To obtain the gold concealed in the cracks and crevices in the old building, wagons were especially made to cart the old material from the factory to the smelting works and every stick of wood in the premises was taken away. The planks of the floors were sawed into small pieces and then burned. The ashes were subjected to a chemical wash and the gold extracted.

The Louisville, New Albany and Chicago road recently put dining cars in service between Chicago and Louisville, and has adopted a plan of serving meals *a la carte*, instead of charging a high price for a regular meal.

All in the Finish.

It is a matter of surprise to Californians that redwood meets with so slow a sale, comparatively speaking, in the country east of the Rocky Mountains. In its native state redwood is a decided favorite not only as a building but as a finishing wood. Its wide, clear dimensions and its beautiful color adapt it to purposes which can be filled by no other than very high priced woods. Counter tops, large panel work and all kinds of house finishing find in redwood a material that readily lends itself to these purposes.

It is little wonder, however, that builders do not employ the California timber to a greater extent than they do at present. In the first place if a man happens to take a fancy to this wood for finishing his building he is met on the start by discouragement from his architect. If this does not deter him and he still persists in his determination, his contractor will also do all he can to change his mind, and perhaps even his lumber dealer will try to convince him that some other wood will suit him better. The number who run the gauntlet of criticism and objection and do not finally substitute something else is necessarily small.

The cause for this wide-spread objection to redwood is not found in any unreasoning prejudice, for nearly everyone admires this wood for all purposes to which it is adapted. It comes from the fact that outside of its native State it is almost never finished properly. As a result its color is not what it should be, and in quality it remains soft and easily marred and damaged. Those interested have at last awoke to this fact and have sent out in many instances to the trade directions for properly finishing redwood work. The following is the method followed on the coast, and has proved to be an unqualified success:

For the first application use one part of boiled linseed oil to five parts of benzine or turpentine. This gives a rich dark color without staining, and by exposure to the sunlight a varied color is obtained, the softer part or end wood turning dark, the other remaining light. The wood should then be treated with two or more coats of shellac and well sandpapered; then apply varnish or hard oil as required, after which, if well rubbed with pumice-stone, a highly polished surface is obtained. Where a light, cheerful finish is required use only white shellac for filler, and shellac, hard oil or varnish for outside coat, hard oil being preferable, as it gives a greater protection to the wood.

The above is said to give the surface sufficient hardness and a lasting polish. It would be a good idea, and one that will perhaps be followed, to exhibit samples of properly finished redwood at the coming exposition. It would serve as a practical educator, and would without doubt give an impetus to the use of this beautiful material.—*The Timberman.*

International Railroad Commercial Congress.

The committee having in charge the arrangements for an International Railroad Congress at Chicago in 1893, beginning June 19, has issued a preliminary list of topics to be discussed, and invites criticism upon it. The Chairman of the Committee is George R. Blanchard, Chairman of Central Traffic Association, Chicago. The list is as follows:

The original development and present condition of railroad commerce in different parts of the world.

The influence of railroad commerce on the settlement and development of the countries.

The practical results of railroad commerce to producers, carriers and consumers.

The proper elements of the cost of safe and efficient service.

The practical effects of free competition in the construction and operation of railroads.

The proper protection of the private rights and interests involved in strikes, and what should be done in the way of prevention and control.

Railroad employés; what should be done for their protection and improvement.

Railroad accidents; their causes and the practical safeguards against them.

Railroad receiverships; the practical lessons they teach.

Government regulations of transportation and practical results thereof.

Freight traffic; special contracts, limitations of common law liabilities, clearing-houses, traffic pools, etc.

Interstate and international arrangements: their practicability, the best means for their promotion and their influence on the commerce, peace and prosperity of the world.

The English Consul at Chicago has sent a report to the home government on the progress of the World's Fair. Among many items of interest in this report the following table appears, which shows how the size and cost of the buildings at Jackson Park exceed those at the Paris Exhibition and the Philadelphia Centennial:

	Paris.	Centennial.	Chicago.
Area of grounds, acres	238	284.49	633
Area of buildings, acres	75.5	70.08	149.19
Cost of buildings	£720,752	£1,037,966	£1,457,206

The approximate exhibit space at Philadelphia was 4,323,330 square feet, and at Chicago it is estimated at 9,138,888 square feet.

Mechanical Improvement.

The careful observer who looks back a few years cannot but realize the great changes that have been made in that time, not only in the art of wood-working, but in the machinery used for that purpose; that the earlier machines invented and designed for that purpose were in many cases rude, as compared with modern machinery, and, while they answered the purpose for the time, yet in comparison with modern machinery they were the basis only upon which the latter are constructed.

In building the first machines for planing, the principal idea of the inventor was to construct a device for reducing lumber to a uniform thickness, with less labor than performing the same by hand. Various devices were attempted in England for that purpose before the rotary cutterhead was introduced. The first machines had nothing in the way of automatic feed. The stuff was pushed over a table by hand, much in the same manner as the modern buzz planer or jointing machine, yet it established the fact that rotary cutters could be used for that purpose.

There is nothing to show that any attempts were made to introduce an automatic feed with success until William Woodworth made his invention, which was patented in this country in the year 1828. There is no doubt but Woodworth was the first in this country at least to combine with a rotary cutter a positive automatic feed; and from the fact that it was able to plane one side of a board and reduce it to a uniform thickness by an automatic feed, it was not only considered one of the wonders of the age, but intelligent men were found who predicted that it was destined, if brought into general use, to ruin the trade of the carpenters.

Although William Woodworth is generally credited with the invention of the planing machine which still bears his name, such was not really the case, for the rotary cutterhead, which is the most important part, had long been in use and was well known in England, yet this formed the true basis of his invention, which was simply the use of an old and well known device in combination with another. The claim in his original invention shows this to be true. It says: "I claim the combination of the feeding rolls with rotary cutters, etc." Therefore the original invention was simply a combination of two devices, which produced a new result, and the first machine was simply intended to plane one side of a board and at the same time reduce it to a uniform thickness. The addition of the matchers was another invention of which the original machine formed the basis. They were not added till some time after his first machine was in successful operation. Then a patent was granted in which the first claim was repeated and another one added covering the use of the side cutters, still in combination with the feeding rollers, which constitute an automatic feed.

The improvements upon the original machine during the life of the original patent and its several extensions were few, from the fact that the patent was controlled by a monopoly, which effectually shut out everything in the way of improvements. Not until after the year 1856, when the patent finally expired and became public property, were any improvements to speak of added. The present modern planing machine with all its improvements, which has brought it to its present state of perfection and efficiency, were made since that time. But these improvements have not been made by any one man; different manufacturers have studied the wants and requirements of woodworkers, and have each added improvements until it would appear that perfection was nearly attained; and if William Woodworth could come back to this earth and look upon the modern planer and matcher, feeding the lumber at the rate of from 80 to 100 lineal feet per minute, he would scarcely recognize this as the results of his invention of 65 years ago.

What is true of the planing machine is equally true of all other machines used in modern wood-working establishments. Skilled workmen have grown with these improvements, and the operator of 40 or 50 years ago, although he may have been considered at that time a skillful one, would be but little, if any, better in the mill of to-day than a green hand.

It is, therefore, well that these improvements have come gradually, for if it were possible that the first planer or molding machine had possessed all the improvements of the modern machine, it is doubtful whether they would have been successfully introduced, for the reason that much of the work performed by the modern machine was not called for at that time, and it is doubtful if men of sufficient skill could have been found to operate them. The band saw mill is a practical illustration: Although the bandsaw has been in use in France for many years, and was, comparatively speaking, an old device, yet the failure of many of the first band mills in this country was not so much from certain imperfections (since corrected) as from the lack of skillful operators to run them. Even among the best circular sawfilers and sawyers, very few were found able to successfully manage a bandsaw until they had made themselves familiar with the new practice.

The circular saw mill passed through the same ordeal upon its first introduction. While many expert filers and sawyers of the upright saw could be found, it was several years before a sufficient number of men were found who could successfully run a circular mill and keep the saws in perfect order. But as soon as a sufficient number of sawyers became educated in its use, the circular saw mill entirely superseded the upright. The modern gang mill is about the only style of reciprocating saw at present in use, and only the fact that much thinner saws are used, and thereby a saving in lumber effected, has kept the gang mill from disappearing long ago.

Now that the band sawmill has become a success, and skillful men are fast being educated in its practical use, there is no doubt but history will repeat itself, and both the circular and gang will in time give way to their successful rival for the manufacture of lumber from the log. The advantages in economy in favor of the bandmill are fast becoming apparent. The thin saws used by the band can never be approached by the circular. While the average circular makes a kerf at least one-fourth inch, the band only requires about one-half that amount. The saving of one-eighth inch in the saw kerf amounts to enough to make a great difference in the product of a day's sawing. Still, the success of the bandmill will depend upon the skill and dexterity of the filer and sawyer. The time is approaching fast when the faithful old circular, like many other devices, must give way to a successful rival.—*The Wood-Worker.*

Folly on Parade.

It is sometimes suggested that the railroad papers might do a good work and one of much interest to their readers if they would make the illustration and description of newly patented inventions pertaining to railroads a special feature of each issue. While none of the American railroad papers follow this course, as some of our contemporaries across the Atlantic do, it is quite likely that no real improvement in any feature of railroad operating is long unheralded in this country. The truth is that a very large majority of inventions that are intended to improve on existing conditions and practice are simply impracticable, and of no interest except to show the foolishness and ignorance of men who are ambitious to pose as inventors, but whose knowledge of the conditions they seek to improve is very limited and superficial. A vast majority of the illustrations of *The Patent Office Gazette* constitute a parade of folly that is very disappointing to practical men looking for improvements. The small proportion of good inventions that are there illustrated are quickly and widely published in the respective trade journals. The general fate of the others is the merciful one of being still-born. For the purpose of illustration we rescue a few from this fate and in the reproductions below give them a new lease of life.

Inventive genius has probably spread itself more in the field of automatic car couplers, during recent years, than in any other, and we present herewith in Figs. 1, 2 and 3 a few samples of many such designs that adorn the pages of nearly every issue of the official publication.

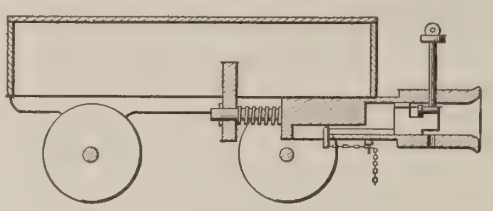


FIG. 1.

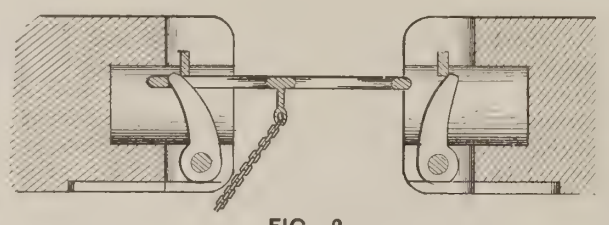


FIG. 2.

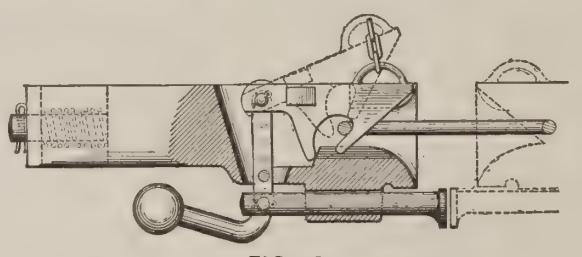


FIG. 3.

Journal boxes receive a good share of attention, and the possibilities of an improvement in this very important detail of railway cars have proved a snare to entrap the purse of many sanguine inventors. Below is shown a couple of the latest efforts. Fig. 4 is a journal box designed to afford means of oiling the journal from the top as well as the bottom, as with driving boxes. The other, Fig. 5, is a complication designed for a roller bearing journal box.

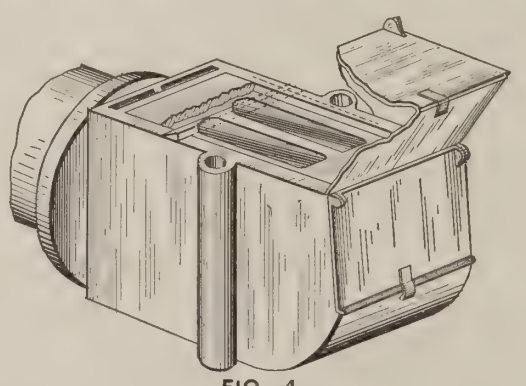


FIG. 4.

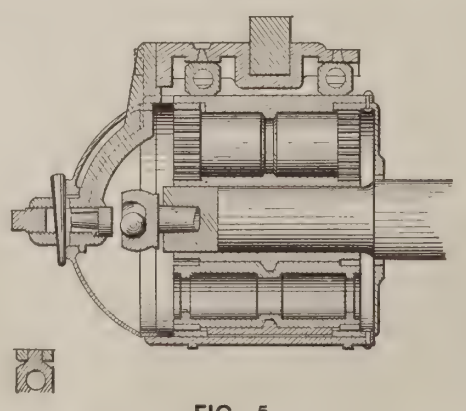
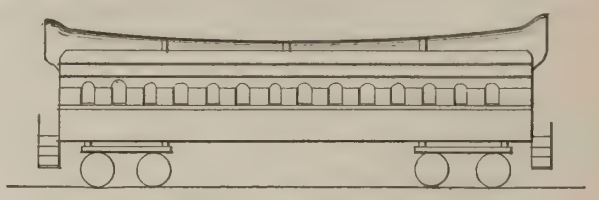


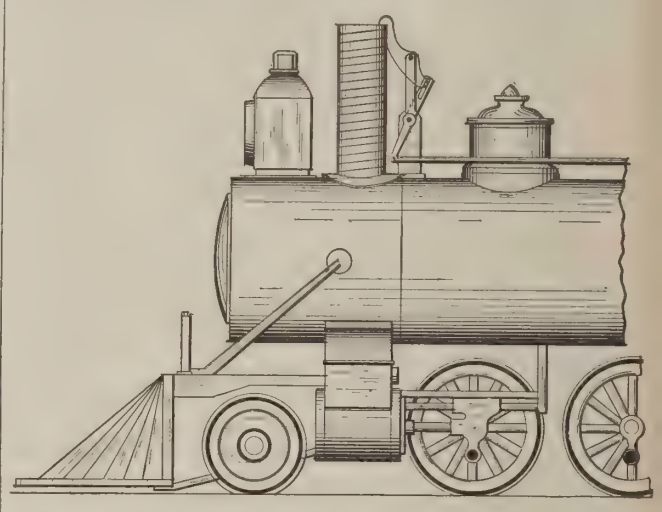
FIG. 5.

The claim of the inventor describes the following innovation in car construction as "A car provided with an outer casing extending laterally over its top and forming a lateral longitudinal opening and provided with enlarged flaring ends extending entirely across the car, whereby the smoke and cinders from a casing of one car of a train will be delivered into the casing of another car without employing couplings to connect the casings." Why this is desirable, and how the smoke and cinders are to be trained to behave



themselves and enter the casing on the first car of the train instead of shooting above its possible height, or blowing on either one side or the other, all of which they generally do, is left for the reader to guess.

Improving the locomotive is a field wide enough to allow a good many curious pranks of inventive ability. The following is a recent example of the worth and practicability of many such: The claim describes it as a combination "with a smokestack consisting in a strip of metal coiled spirally, of a lever with curved face having



an arm attached to the upper end of the smokestack, and means for moving the lever to bend the stack into contact with the curved surface." What useful or sensible purpose such a jumping jack arrangement is able to serve is a problem that is left for the intelligence of the reader to solve.

Improving the details of cars and locomotives is a very fruitful field for well informed, practical car and locomotive men to work in; for others it is full of pitfalls and disaster.

A Bad Wreck on the Reading.

The Shamokin express on the Philadelphia & Reading Railroad ran into a train of empty coal cars, about eight miles north of Philadelphia, at a few minutes past 9 A. M. Oct. 24. Seven persons were killed outright, 19 injured persons were taken to St. Timothy's Hospital at Roxborough and several others were treated at other places.

Among those killed was a young lady of 25, an old lady of 60, a member of the Pennsylvania Legislature, a brakeman of the coal train, and the fireman and newsboy of the passenger train. The trains came together on a curve. The baggage car caught fire, probably from the engines, and was consumed. The smoking car telescoped the car behind it.

The express left Pottsville at 7 A. M. At Phœnixville orders were received to run south on the northbound track from West Conshohocken to West Falls, a distance of only a few miles, regardless of all other trains, which was done. The train was composed of five cars, including a Pullman parlor car. The southbound track was blocked with freight cars, and to this fact is primarily due the catastrophe. Train No. 538 of empty coal cars started north from West Manayunk on the northbound track shortly before 9 o'clock. There is a conflict of reports as to the orders given the crew of this train.

Pennsylvania Railroad Compound Locomotive.

The Pennsylvania Railroad has just completed at the Altoona shops a compound passenger engine with seven-foot driving wheels. It is a two-cylinder compound, and weighs 72½ tons. It is an eight-wheel engine with driving wheels seven feet in diameter and the weight on them is 90,000 pounds. The boiler pressure is 200 pounds per square inch. The high pressure cylinder is 19½ inches and the low pressure 31 inches in diameter, and the stroke is 28 inches. The boiler is five feet in diameter and 27 feet long. The grate is 40 inches wide and nine feet long. The valves are piston valves 12½ inches in diameter, and are placed between the cylinders. This type of engine will be known as Class T, and the number of this one is 1,515. The truck wheels are 42 inches in diameter, steel tired, with wrought iron centers. The tender has only three pairs of wheels 42 inches in diameter.

The Ensign Car and Manufacturing Company, of Huntington, W. Va., has put in new machinery and has built several additions to their shops. A portion of the machinery added is for working scrap into nuts and bolts and a machine for forging links and pins.

The Western Railway Club.

The regular monthly meeting of this club was held in its rooms at the Rookery Building, Chicago, Sept. 20, President Peck, presiding. Mr. A. M. Waitt read a paper on "Car Heating by Steam," an abstract of which was given in the October issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

This being the annual meeting of the Club, the reports of officers were received. The Treasurer's report showed a balance on hand of $528.90. The Secretary's report showed outstanding assets of $207, nearly all of which was unpaid dues. The membership numbers 190. Mr. W. H. Lewis, of the C., B. & N., was elected President; Mr. A. M. Waitt, L. S. & M. S., First Vice-President; Mr. Wm. Forsyth, C., B. & Q., Second Vice-President; Mr. W. H. Marshall, *Railway Master Mechanic*, Secretary, and Mr. Allen Cooke, Treasurer.

Mr. E. M. Herr's paper on the "Irregular Wear of Locomotive Driving Wheel Tires," read at the May meeting of the Club, was discussed at some length. Mr. Lewis presented some diagrams showing the wear of locomotive tires between turnings, and particulars giving the mileage made, and average mileage between turnings and per 1-16-inch wear.

Mr. Lewis: While the mileage per 1-16 inch in reduction gives a fair means of comparison for wheels of the same diameter, it is obviously not a fair comparison for wheels of larger or smaller diameter. Total tread wear area is therefore found by subtracting the area of the circle, having a radius equal to that of the worn tire at its lowest point or flat spot after its last turning, from a circle having a diameter equal to that of the new tire without reference to the width of the tire. Tread wear area between turnings referred to mileage, is found by calculating the difference in area of the circles to which they are turned and dividing the same by the mileage between those turnings. This will give what might be called radial square inches worn away and would be represented by a ring equal to the amount worn from the tire as measured from the line $2\frac{7}{8}$ from the inside edge of the tire. A square inch in such a ring for a

4	in.	tire	on	a	44 in.	wheel center new is	1-166	in. thick.
4	"	worn to 1 in.	thick		44 in.	" " " "	1-144	" "
4	"	tire	on	a	56 in.	" " " "	1 201	" "
4	"	worn to 1 in.	thick		56 in.	" " " "	1-181	" "
4	"	tire	on	a	57 in.	" " " "	1-204	" "
4	"	worn to 1 in.	thick		57 in.	" " " "	1-182	" "
4	"	tire	on	a	63 in.	" " " "	1-216	" "
4	"	worn to 1 in.	thick		63 in.	" " " "	1-206	" "

Hence you will see from the above that mileage per 1-16 of wear is not an equable basis for driving wheels of various diameters, and the proper comparison of miles run per square inches of material worn, which is obtained by dividing the total mileage by the means of the tread areas given above. To illustrate: The total wear of a 4-inch tire on a 44-inch center is 960 square inches when worn to 1 inch in thickness, while the same thickness of tire worn on a 63-inch center is 1,344 square inches; thus you will see that there is 384 square inches more worn from the large wheel than the smaller.

In following out the data and diagram presented by Mr. Herr at the last meeting, I found that it was very confusing to retain the connection and location of the points mentioned, and, to simplify the matter, I condensed his tables into the circular diagram shown herewith, the circle representing the driving wheels divided in the same manner as described by Mr. Herr. The line of rotative force is located nearer the center of the circle than the one showing the pressure of the rail as influenced by the centrifugal force of the balance. In that manner, I think it is much easier to trace these connections and to follow the argument, than it would be in the form represented by Mr. Herr.

I find that universally, with our eight-wheel engines, the flat spots occur between 90 and 120 degrees. I have compiled a list of the measurements of the flat spots and their location, which is embodied in the accompanying table. Engine No. 2 was one of the engines that were employed on the hilly portions of the road east of Savannah, and we all know that the speed with which that engine runs at times is as great as it is on the main line, if no greater. In one instance, when the wheels were turned, they showed no flat spot, and on the next turning showed a very slight one.

Now with our switch engines, the flat spots were imperceptible. In those where flat spots occurred, they had no uniform location with reference to the division of the circle, but were evidently due entirely to some defect in the tire.

Mr. Forsyth: We are certainly indebted to Mr. Herr for the formula and method presented in his paper for determining the forces which produce slip and wear in locomotive tires; also to Mr. Lewis for his study of the paper. There are several questions which I would like to ask both Mr. Herr and Mr. Lewis in order to make clear a few things that seem now uncertain. In Mr. Herr's paper I do not understand exactly what is meant by the average overbalance weight at the crank pin; is it an overbalance above that which the balance should be, as calculated by the regular rule, or is it the weight in excess of that which is necessary to balance the revolving weight? The term "overbalance" does not appear to be clearly defined.

I would also like to know if these engines from which records were taken have driver brakes, and if so, what kind of shoes are used.

Mr. Lewis: All of the engines referred to by me have the Ross-Meehan shoe, so that there is no brake shoe contact upon that part of tread that comes in contact with the rail.

Mr. Forsyth: From diagram 5, on page 183 of the May proceedings, I understand that the lowest spots in the tire are only from .04 to .07 of an inch deep. This being the case, these irregularities do not seem to me to be very serious. I am not sure from the data given whether the maximum of .07 inch would have to be turned off each side of the wheel or whether the whole diameter would have to be reduced to that amount in order to true the tire, but whichever it is, the irregularity of the wear of the tires on this large number of engines would seem to be quite small; perhaps only $\frac{1}{16}$ inch would have to be turned of in order to true them up. I take it that the engines were not brought in especially for tire turning, but that they had been out long enough to make a good mileage and required general repairs. If that is the extent of this irregularity, it is certainly not a serious thing. Now, if it is a fact that these engines were overbalanced 170 pounds in the front and back wheels, and did not produce any greater irregularity of wear in their tires than these diagrams indicate, it certainly brings out the important point that an engine can be very badly balanced without producing a bad effect on the tires. I have compared this wear with some of our own engines which are balanced according to the rule given in the paper, and I find that the wear is just about the same; so that the conclusion that I draw from this paper, and Mr. Lewis' experiments made with engines without the reciprocating parts balanced at all, would be as stated above—that an engine may be incorrectly balanced without producing very irregular wear of its tires.

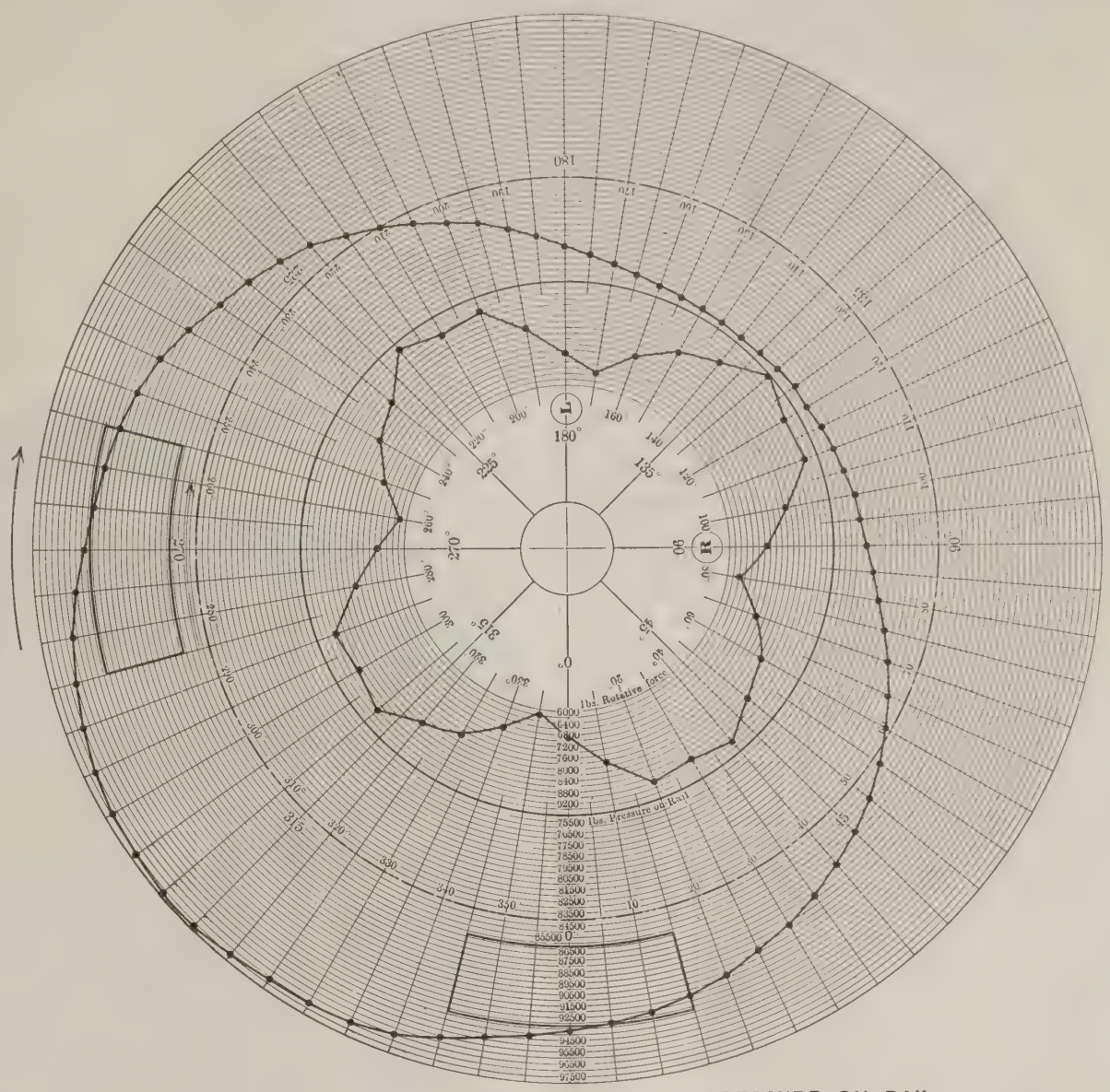


DIAGRAM SHOWING ROTATIVE FORCE AND PRESSURE ON RAIL.

The conclusion of Mr. Herr's paper that 11,000 pounds pressure produced but little abrasion, confirmed by the measurement of a large number of engines, is one which I do not think we would dispute at all. That is a confirmation of Mr. Barr's statement in his paper read before the club in January, 1891. Mr. Herr's first conclusion that the weight of reciprocating parts and consequent overbalance should be as light as possible is one we all accept as desirable, not only because of tire wear, but for the good riding of the engines. With reference to his second proposition, that as small a portion of the reciprocating parts should be balanced as is conducive to smooth working, I would like to ask Mr. Herr if, as these engines went through the shop, it was thought necessary to change the counterbalance, and if this extra weight in front and back wheel was removed; and also in his study of the question whether this irregular wear of tires is important enough to still further reduce the amount of reciprocating balance (two-thirds of the reciprocating parts) which is distributed among the wheels.

Mr. Herr: Answering Mr. Forsyth's inquiry in regard to overbalance, I will state that the weight given is the average weight that was required to be hung on the crank pin to balance the counterbalance; in other words, it is the actual static overbalance, without any consideration of reciprocating parts. Of course, the wheels were not all uniform. Some were overbalanced statically more than 400 pounds; others had just about enough static overbalance to equal the amount of balance that would be added by balancing two-thirds of the reciprocating parts distributed between each wheel, but they all agreed in being overbalanced in the forward and back wheels, and underbalanced in the main wheels. In regard to the amount of wear shown in diagram No. 5 in the May proceedings, Mr. Forsyth is correct; it is small. But this is the average wear of all these engines. Of course, the tendency of averages is to reduce the maximum in any particular case.

I would also say in answer to Mr. Forsyth that it was necessary to change the counterbalance in the engines passing through the shop. In regard to the slight degree in which the counterbalance affects the irregularity of the wear, it is true that it is not much, so far as the counterbalance hammer is concerned. In that way it has small effect. If the tendency to slip could be avoided, I do not think the irregularity would be perceptible, even if the engine was badly overbalanced. But the bad effect of badly balanced engines, as far as irregularity of wear of tires is concerned, comes from the very irregular pressure of the wheel upon the rails and the greater tendency of the engines to slip, due to the reduction of weight upon the wheel and consequent lack of adhesion. In a badly balanced engine the spots on the tire are worse than in a well balanced engine.

The curve of coefficient of slip for 80 and 40 miles an hour shows an interesting principle which I would like to call attention to. At 80 miles an hour, the maximum coefficient slip is just .12. At 40 miles an hour, although, of course, the mean effective pressure at the highest speed is less, the coefficient slip reaches .1272 at 130 degrees in this particular engine. If the speed was increased to 50 miles an hour, the coefficient of slip would rise still higher, and at a very high rate of speed would undoubtedly eventually equal the coefficient of friction and cause an imperceptible slip. I think it is probable that the statement is true to which Mr. Barr called attention just after the paper was read, a law discovered by some German engineer, that an an engine has an imperceptible slip at very high rates of speed. I was inclined to doubt it, but, looking into the matter further, I think it is probable that there is an imperceptible slip at a very high rate of speed, owing to the effect of the counterbalance of the driving wheels.

Mr. Lewis: Mr. Herr, I would like to have you explain the case of engine No. 150, where the dotted lines show the location of the flat spot and the depth of it when the engine was counterbalanced to almost the full extent of the reciprocating weights and the flat spots shown in full lines occurred with the entire reciprocating weights removed and nothing but revolving balance in the wheel.

Mr. Herr: The spots are not entirely due to the counterbalance. I should say that in the case mentioned, the worst spot was produced by what I call the first case of slipping; that is, when the engine is pulling hard and the engineer is watching it carefully and it slips just a little, stops and slips again, the engine moving so slowly that the amount of counterbalance has no effect. What I call the second case of slipping is when the wheels "let go" entirely and spin with considerable velocity; then the centrifugal force of the counterbalance produces a variable pressure on the rail and cause a variable wear.

Mr. Lewis: If it is so, might it not be that the entire development of flat spots is due to the slipping and not to the counterbalance? My investigation has led me to believe that this is the case. Now there is engine 60 that was used in suburban service, where the speed developed by the engine was as high as it is on our main line trains, and yet you see that there is not a flat spot on the tire, while an engine on the same class exactly, with the same weight of counterbalance, flattens when in other service.

Mr. Herr: I think Mr. Lewis is entirely correct, and perhaps I have given an erroneous idea of my views in this matter by writing so much about the counterbalance. It was necessary, in order to determine the rotative effect and the forces in action, to go quite thoroughly into the question of the counterbalance.

In reply to Mr. Forsyth's last question as to whether the proportion of reciprocating parts balanced should be further reduced I should say that if the reciprocating parts can be reduced in weight any I think the proportion of their weight balanced should be reduced; if they are made heavier I do not believe it is policy to do so. I have handled engines when the proportion of the reciprocating parts balanced was less than the amount shown here, and some with more, without any very positive indication either one way or the other, but what indication I did get from the study led me to think that, with the present weights of reciprocating parts, this rule is nearly correct.

A consolidation of brake beam manufacturing firms has been effected, The new company is called the American Brake Beam Company, of Chicago. The companies included in the consolidation are the Michigan Railway Supply Company, of Detroit, who own the Central brake beam, Schoen Brake Beam Company, of Pittsburgh, Northwestern Equipment Company, of Chicago, controlling the Kewanee brake beam, and the Universal Brake Beam Company, of St, Louis.

The Central Railway Club.

The Central Railway Club met Sept. 28, at Buffalo, N Y. with President Eugene Chamberlain in the chair.

The meeting was the first held since the usual summer vacation, and in calling the members to order President Chamberlin said it had seemed well that on this occasion a study should be made of the interchange rules as revised by the M. C. B. Association.

After an exchange of ideas regarding practice under the interchange rules and their interpretation, Mr. Mackenzie took occasion to say that though the committee to confer with the Superintendents had been continued he thought they had accomplished all they could and the matter was now with the Club. It was his opinion that something could be agreed upon under which the improvement sought could be secured. He cited several cases where cars with certain defects were safe to run for local delivery.

Mr. Chamberlain said the New York Central accepted 70 per cent. of the cars offered for local delivery, but where only chalk marks were used there was danger of these being washed off in a rain storm, and the cars would get into New York Central shops. He suggested that a motion be made to the effect that the committee notify the Superintendents that cars for local delivery will be accepted, provided they are properly carded for defects and returned to the owners empty.

Mr. Bonner failed to see what the Central Railway Club had to do with a matter of no special interest except to a few local roads. He moved, as a sense of the meeting, that while the Club was willing to concur in any arrangement made, it did not seem to have the right to do any thing more than to assent to the acceptance of a car for local delivery provided it bears the M. C. B. defect card with an additional card directing that it be returned to the owner empty.

Mr. Mackenzie was desirous that the inspectors shoul sign the additional card.

Mr. Chamberlain was opposed to this, and insisted that it should be attached by some other individual. This was agreed to, and the motion as thus amended carried.

President Chamberlain announced as the subjects for the next meeting, "What may be considered home defects on freight cars; defects that may be passed to owners by inspectors?" The following committee was appointed to prepare the report: A. M. Waitt, E. D. Bonnar, R. C. Blackall, J. R. Petrie and W. H. Raymond.

Annual Report of Pullman's Palace Car Company.

The report of Pullman's Palace Car Company for the year ending July 31 compared with the previous year shows:

Earnings, cars	$8,061,081	Inc.	$189,935
Patents	21,751	Inc.	2,250
Manufacturing, etc	1,919,523	Inc.	37,847
Total gross	$10,002,356	Inc.	$230,032
Operating expenses	4,386,366	Dec.	191,638
Net	$5,615,990	Inc.	$421,670
Interest	65,600		
Balance	$5,550,390	Inc.	$421,670
Dividends	2,300,000	Inc.	300,000
Surplus	$3,250,390	Inc.	$121,670

The balance sheet shows an increase in the capital stock of $5,000,000; amounts written off surplus account, $560,-015; against $603,829 in 1891, leaving the surplus invested in the assets of the company $22,083,680. The assets are:

Cars, etc	$25,710,351	Inc.	$820,798
Pullman, Ill	7,460,280	Inc.	154,189
Real estate, etc	1,779,653	Inc.	1,595
Patents	113,124	Inc.	13,751
Stocks and bonds	4,542,353	Inc.	1,168,171
Cash	520.662	Dec.	33,629
Bills receivable	8,496,742	Inc.	5,619,981
Material	4,614,575	Dec.	48,914

The new cars building for World's Fair traffic are 415, estimated to cost $5,500,000. The passengers carried the past year were 5,279,020, against 5,310,813 in 1891. The company paid in wages at Pullman $2,918,997, an average of $590.65 per annum, against $610.73 in 1891. In all departments it paid to 12,809 people $6,619,156, against 13,885 people $7,303,108 in 1891. The company runs cars on 125,111 miles of road.

Southern and Southwestern Railway Club.

The next meeting will be held at Atlanta, Ga., on Thursday, Nov. 17, when the election of officers for the coming year will take place. The subjects for discussion will be: 1st, "The best course to pursue to reduce oil consumption in engines and cars." 2d. "Driving boxes—best material and shape, in order to prevent breakage and wear. Is the solid box suitable for heavy engines?" 3d. "Staybolt inspection." The following committee is to report: W. H. Thomas and Pulaski Leeds, on "repair work on large systems and location of plants for same,"

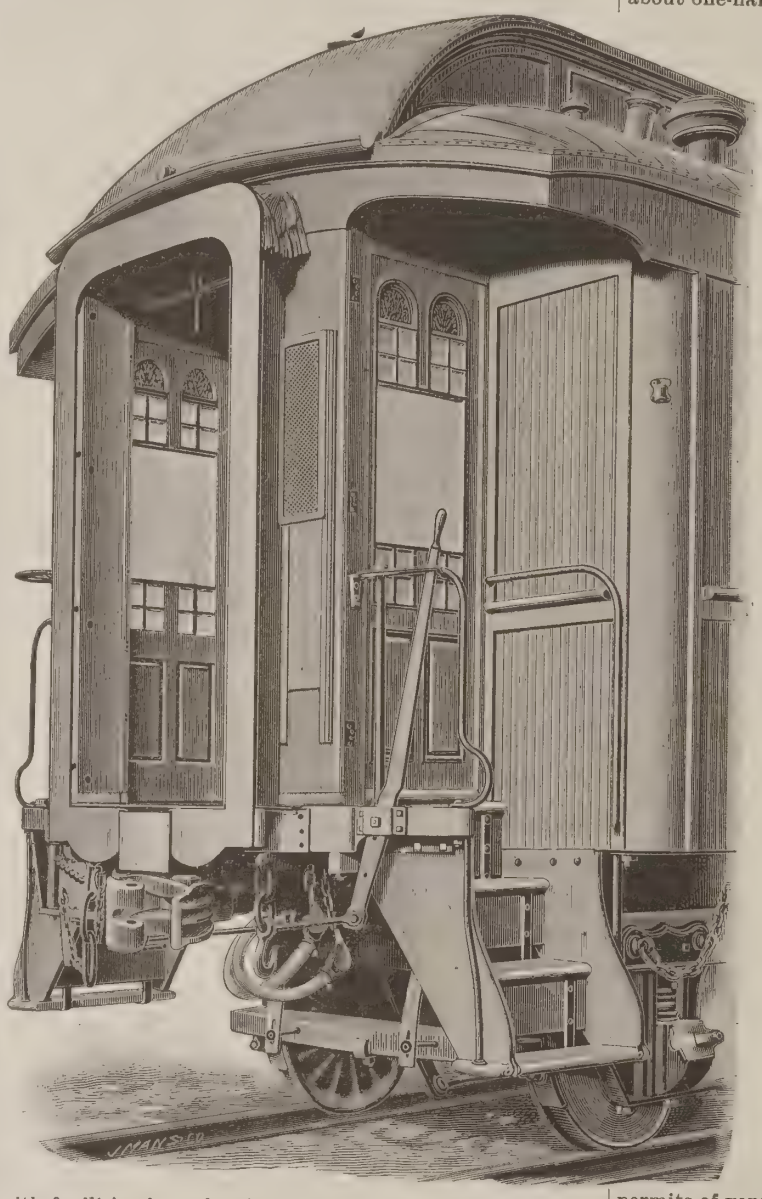
Duluth & Iron Range is building a three-story brick laboratory at Two Harbors, Minn. The dimensions are 24 by 40 feet, and the building will contain an equipment for chemical and physical tests.

A dispatch from St. Petersburg, dated Oct. 22, reports that heavy snow storms have prevailed in the Syzran district and railway communication is interrupted. The snow lies in heavy drifts along the line and several trains are stalled.

Car Works at Houston.

Preparations are being made for the erection of large car building works at Houston, Tex., under the superintendence of J. M. Sweet, of Boston, and J. M. Beale, of the Portland Car & Machine Works, and for many years its superintendent. The building will be completed in four months. Orders for machinery have already been awarded. Four buildings will be erected, and in their construction the future will be considered, so that enlargement can be made. Two of the structures will be 120 feet by 60 feet each, and the other two 80 feet by 60 feet each. The larger will be used for a planing mill and construction houses, and the other for blacksmithing and other purposes in connection with the business. All are to be built of brick with metal roof. The machinery has been ordered and will soon begin to arrive, as it is intended to begin operation by Jan. 1. The latest labor saving devices will be used, so that cars may be built as cheaply as possible

In the cost of lumber a saving of nearly one-half will be made, as the cost of transportation to Eastern works is about $10 a 1,000, and the re-shipment of cars to the great railway centers will be saved. The works are to be built with a view to construct at least 1,000 cars per annum,



with facilities for enlarging to any extent that the trade may demand. The cost of buildings and machinery is estimated at $125,000, but the capital at their command, they say, is ample for all requirements, and if they can get orders for 10,000 can instead of 1,000 they will be built. With cheap lumber and the best of wheels made at their door those interested in the company are confident that the enterprise will pay. Freight cars only will be constructed at first, but later on passenger coaches will be built.

The London & Southampton Ry. has put on two Pullman cars to run between London and Southampton, 79 miles.

There is a great shortage of freight cars reported at Denver and Houston, Tex., and in many places in the Central Western States.

On account of being somewhat crowded for track room at Palo Alto, Pa., the Philadelphia & Reading has decided to move its car shops from that place to St. Clair, Pa.

The Hall Signal Company and the American Iron and Steel Car Wheel Company are building extensive plants at Garwood, a newly-established town near Westfield, on the Central Railroad of New Jersey.

An Awful Risk.—Casper Corker—Say cull! If I was goin' to kill meself, I'd take morphine.

Jonas Deadbeat.—Don't you never do it.

Casper Corker.—Why not?

Jonas Deadbeat. A friend o' mine did it onct, an' they found 'im an' walked im eight hours to bring 'im to!

The Barr Vestibule.

As mentioned in the last issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, the Drexel Railway Supply Company, of the Rookery, Chicago, is now manufacturing the Barr vestibule for passenger cars, designed and patented by Mr. J. N. Barr, Superintendent Motive Power and Car Department, Chicago, Milwaukee & St. Paul Railway.

The illustration of this vestibule presented herewith shows several new features and some points of advantage over the former design.

One of the principal ones is the substitution of gravity for the overhead springs as a means of keeping the face plates in contact at the top. The face plate is arranged as formerly. Just above the point where it is joined to the buffers, and at right angles to it, is riveted an angle plate. The inner point of this angle plate rests upon a chafing iron on the platform, and slides over it as the face plate is forced in and out. The face plate is riveted to the buffers as before, but does not rest upon them, they rather being suspended to it. As a result the entire weight of the diaphragm is supported at the inner point of the angle iron resting on the platform. This tends to tilt it out at the top with a force equal to a heavy spring. This outward tendency is limited by the canvas covering and ties at the top. An additional tilting of the face plate is permitted by means of slotting the holes in the hinge plate on the outer panel. The normal position of the face plate is about one-half inch beyond perpendicular; as a result, when two vestibules come into contact, a total compression of one inch at the top is necessary before the lower surface or buffers strike. This throws the entire horizontal or tilting weight of the vestibules against one another and thus keeps them in close contact. The advantages of this are that the overhead springs, which require a special arrangement in the top of the car, are done away with, and the application of the vestibule to both old and new cars is made much easier and less expensive, and the cost of maintenance is reduced. The anti-telescoping feature is preserved without the use of the overhead spring, as in both cases when the shock comes the face plates are driven in flush. These then give a continuous bearing around their entire surfaces to resist the shock.

The rubber or canvas diaphragm is done away with in this design, and for it are substituted two wooden panels hinged together and operating as a folding door. In order to gain a more flexible movement of these, and for other reasons, the post is set over just above the side sill, instead of directly back of the face plate, as heretofore. The folding panels are placed in between; as the face plate is forced inward or outward, the outer panel moves backward and forward in a line almost parallel with the center of the car, carrying with it the inner panel swinging on a transverse line. Sufficient clearance is allowed between the panel and the post to permit of the swinging. All the clearances between the panels and the post, and at the top and bottom of the panels, are covered over with strips of two-ply rubber.

This broadening out of the space between the posts gives the use of the entire platform at all times, and permits the use of an ordinary coach door for the vestibule, instead of the expensive folding doors, as heretofore. The door, when open, does not cut off any more of the passageway between the cars than the folding door.

A window is cut in the inner panel, as shown in the cut, and provided with a vertically sliding sash and screen. This permits of ventilation of the car at the ends, without opening the vestibule doors.

This vestibule has been in use three years on several large systems, and is now well known. It can be applied to any platform. The buffers at the side are made of a peculiar shape to receive the face plate. Between them is placed the main center buffer, giving, in effect, a continuous plate This arrangement is the same in the new. These buffers are applied to the car according to the familiar Miller plan.

Not in His Line Exactly.

A man with an armful of handbills went into Mr. Schop penheim's restaurant and asked permission to tack a hundred or so to the wall.

"Vot vos dose?" asked Schoppenheim.

"Circulars advertising a railroad excursion."

"You goes avay off mit a week or den days, and you goes sheaper as to stay at home?" asked Schoppenheim.

"That's it."

"Und you vants to hang dose cirgulars mein restau rant in?"

"Yes."

"Den mein gustomers vould read dose cirgulars und go avay off den days or two veeks?"

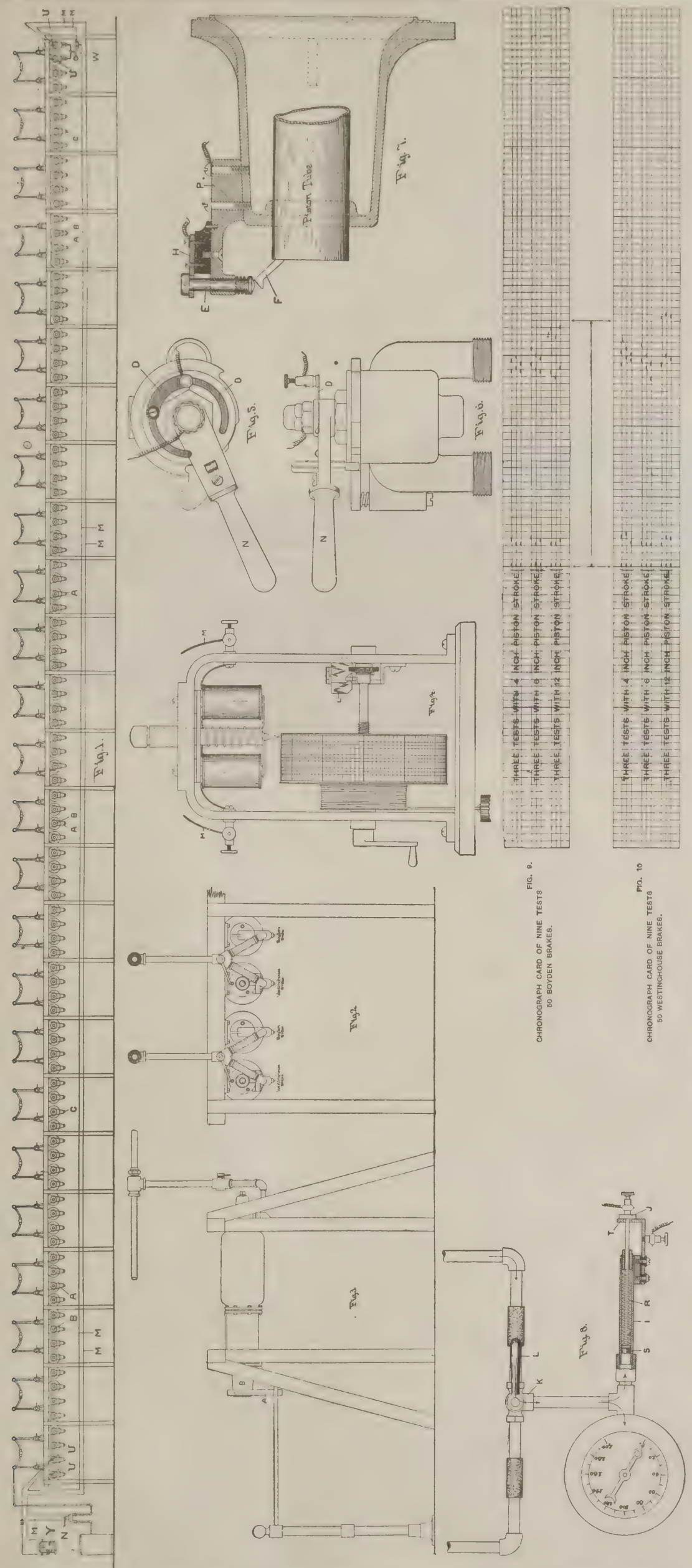
"Yes."

"Und don't eat dinners here vile dey vos avay?"

"Well, they gould hardly do that, you know," said the handbill man, hesitatingly.

"Dot's vots I dinks meinself. Nein, I guess I won't have any of dose pills hung mein restaurant in. Good day, mein friendt."

It is doubtless a Munchausen story that French railroad men eat railroad frogs.



BRAKE-TESTING RACK USED AT BOYDEN BRAKE CO'S SHOP, BALTIMORE, MD.

To demonstrate ocularly that the Coffin toughening process does toughen, the Cambria Iron Company has sent us a sample case containing two specimens taken from the same forged rod; one before toughening, the other after toughening, showing the appearance before and after toughening.

The increase in density and the improvement in the mass structurally is very noticeable. The difference in behavior of the two in practice is said to be as great as the difference to the eye. By this process the elastic limit is increased 40 per cent., without raising the ultimate strength or breaking weight, showing no change in chemical constituency, consequently the ideal chemical qualities, the result of long experience, is not altered or changed by the toughening process.

The Frost Veneer Seating Company, of New York, has had to fit up their plant at Newport, Vt., with new cauls and presses to meet the demands of the growing Western trade for their car seats. The company now feels that it is in a position to do better work than ever and on shorter notice.

Air Brake Testing Apparatus.

The Boyden Brake Company, of Baltimore, has been perfecting a plan for testing air brakes that would give an automatic mechanical record of the time of application of the brakes and other records in such a way as to remove errors due to personal equations of the observers. The illustration herewith shows the apparatus:

Fig. 1 shows a rack for testing 50 air brakes and comparing their operation with 50 others under exactly the same conditions, and is designed to make any test required. Fig. 4 shows an electric chronograph which gives four readings when making an emergency application of the brakes, as follows: The time interval between the movement of the engineer's valve, and that of the piston of the first brake; the time between the movement of the first brake and the first movement of the fiftieth brake; the time between the first movement of the fiftieth brake and the instant 55 pounds of air is in the fiftieth cylinder, and the time between the first movements of the engineer's valve and the instant 55 pounds of air is in the fiftieth cylinder.

The complete rack is shown in Fig. 1, and details in Figs. 2 and 3; it contains 100 brakes, 50 being the latest pattern of the Westinghouse and 50 of the Boyden type, arranged side by side alternately. Above the rack is the training pipe for 50 cars, with hose couplings, strainers, cocks and branch pipe as in service. The length of pipe from hose coupling to hose coupling is 39 feet 6 inches, and from quick-action valve to quick-action valve, 46 feet 2 inches; the total length is 1,925 feet. Each branch pipe has a bifurcated cock (see Fig. 2) and connections with the triple valves of both the Westinghouse and Boyden brakes. Both sets of brakes thus have exactly the same relation to the train pipe, and either kind can be thrown in or out of connection by reversing the bifurcated cock. All the Westinghouse and all the Boyden brakes can be tested separately, or the two tested together interchangeably, making a mixed train of any proportion.

To the head, *B*, of each brake cylinder (see Figs. 1 and 3) a yoke, *A*, is pivoted. When making tests of 4 and 6 in piston stroke, this yoke is turned horizontally in front of the piston tube, and a suitable rod then inserted loosely in the hollow piston tube strikes against the yoke, which thus limits the stroke of the piston to either 4 or 6 in., as desired. A piece of rubber, *C*, attached to the yoke, prevents severe jar, and avoids breaking the bolts when applying for emergency.

The air-tank, gages, engineer's valve and chronograph are located at one end of the rack, with driver and tender brakes connected as in practice.

The chronograph, *Y*, shown in detail in Fig. 4, consists of a drum revolved by a weight, the speed being governed by a fan, *L*, so adjusted that the drum revolves exactly five times in a minute; the card which encircles the drum is divided into 12 parts, each representing one second, and each part is divided into ten spaces, each representing one-tenth of a second. Over the drum are two electromagnets, which operate the armature, carrying a pencil or stylographic pen, which is lowered and makes a dash on the card and is raised again, as the circuit is closed and broken. When the circuit is closed the pen is held away from the card, but when the circuit is broken, the pen drops and makes a dash on the card as the drum revolves. The circuit, *M*, has four circuit-breakers located respectively on the engineer's valve, the piston tubes of the first and fiftieth brakes, and on the 55-lb. recorder on the fiftieth brake cylinder.

The first circuit breaker is on the engineer's valve, shown in Figs. 5 and 6, and consists of segment, *D*, attached to, but insulated from, the valve. When the valve handle, *N*, is in the release position, the circuit is closed through the handle, and one end of the segment. When the handle is turned, the circuit will be broken until the handle comes in contact with the other end of the segment; therefore, when the handle is quickly turned to the emergency position, the electric circuit will be instantly closed and broken, causing the chronograph pen to make a dash on the card; the pen instantly rises again in readiness for the first movement of the piston tube of the first brake. Here the circuit is broken by a device, *U*, shown in detail in Fig. 7, consisting of a lift pin, *E*, which, when lowered, closes the circuit, and, when raised, breaks it. The pin is lifted by an incline piece, *F*, attached to the piston tube and is lowered by a spring, after the piston travels its first half-inch. The circuit wires are connected to the pieces *H* and *P*. The breaking of the circuit by the first piston tube will cause the chronograph pen to make a second dash on the card.

The piston tube of the last (50th) brake has a circuit breaker like that on the first brake, and causes the pen to make a third dash on the card, when that piston tube moves its first half-inch.

The last circuit-breaker device, *W*, is connected with the last brake cylinder and consists of a tube, *I* (see Fig. 8), a piston, *S*, and rod weighted by a spring, *R*, which will not allow the piston to move until 55 pounds air pressure is obtained. When it moves it breaks the circuit by lifting the head, *J*, from the piece, *T*, and causes the marking of a fourth dash on the card. The end of the tube, *I*, is connected with a three-way cock, *K*, from which connections are made to the last cylinder of both sets of 50 brakes, so that either set can be tested by reversing the cock handle *L*.

The card from the chronograph, shown in Fig. 9, is a facsimile of nine tests made with 50 Boyden brakes, three being tests with a 12-inch stroke of the 50 pistons, three with a 6-inch stroke and three with a 4-inch stroke. The card shown in Fig. 10 is a fac-simile of nine tests made with 50 Westinghouse brakes, also with 4, 6 and 12 inch stroke. These cards are divided by cross lines to show seconds and tenths of seconds. In reading the card the space from the beginning of the first chronograph dash to the beginning of the second dash represents the time consumed between the first movement of the engineer's valve handle and the first movement of the first brake piston. The space between the beginning of the second dash and the beginning of the third dash represents the time consumed from the first half-inch movement of the first brake piston and the first movement of the last brake piston. The space between the beginning of the third dash and the beginning of the fourth dash represents the time consumed from the first half-inch movement of the fiftieth brake piston to the moment of having 55 pounds air in the fiftieth brake cylinder. The space between the beginning of the first dash and the beginning of the fourth dash represents the total time consumed from the first movement of the engineer's value handle to the attainment of 55 pounds of air in the fiftieth brake cylinder.

The reading of the chronograph for the 12-inch stroke emergency application, as shown by the cards, Figs. 9 and 10, is as follows:

	Boyden.	Westinghouse.
Time engineer's valve to first brake.....	.35 sec.	.40 sec.
Time first brake to fiftieth brake.....	2.45 "	2.55 "
Time fiftieth brake to 55 pounds in B. C....	.60 "	.60 "
Total time in engineer's valve to 55 pounds in fiftieth brake cylinder.....	3.40 "	3.55 "

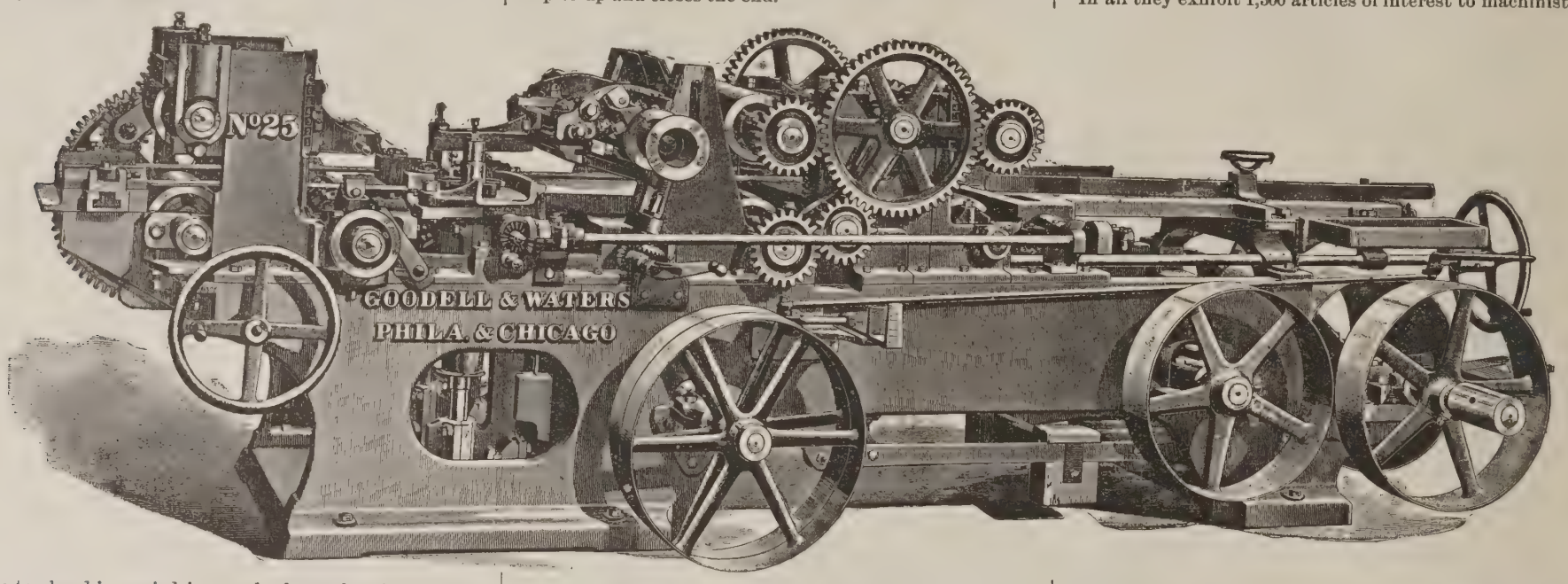
Rapid Feed Flooring Machine.

The machine illustrated herewith is manufactured by Goodel & Waters, of 3003 Chestnut street, Philadelphia, and is made in two sizes, known as No. 24 and No. 25; No. 24 working 9 inches wide and 6 inches thick, and No. 25 working 15 inches wide and 6 inches thick.

The frame of the machine is constructed in a superior manner. The sides have a tubular or cored section running the entire length. The cross girts and the top and bottom head frames are extra heavy. The fence or long guide is moved and locked by a single device in combination with the right hand matcher head.

The feed rolls are double geared, 8 inches diameter. The top delivery roll and pressure plate over the under cylinder are adjusted in the one operation. Both entry feed rolls are raised in the one operation from the infeeding end of the machine and have improved method of effecting pressure on the material. The method of raising the pressure plate over the under head and the device by which the entry bar is dropped away from the head give free access for sharpening or adjusting the knives.

The journals of the top and bottom heads are 2¼ inches in diameter, 11 inches long. The side head spindles have journals 1⅛ inches diameter.



The top head is carried in a yoke frame forming a continuous tie, front and back of the head, with sufficient clearance and adjustment to project the cutters 1½ inches. The knives may be sharpened without swinging the entry bar over.

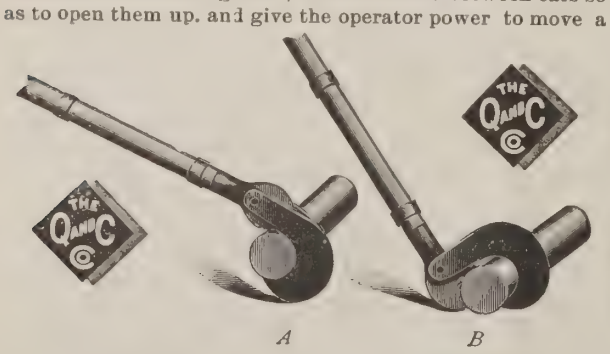
The side head frames are clamped to the cross bar by a new and improved method. The matcher head chip breaker is exceedingly heavy and kept firmly against the work by a weighted pressure.

The device used on all the heads to prevent end play, by means of an adjustable brass plug brought to bear against the shoulder of the head, is worthy of special attention.

The Q & C Car Mover.

The Q & C Company, of 703-707 Phœnix Building, Chicago, manufacturers of railway specialties, are now placing upon the market a most ingenious, simple and practical device for moving cars by hand, called a "Car Mover," and which is entirely different from any similar device now used. It is neatly made, and weighs only about 30 pounds, and has already made many friends among thost who have used it.

This device is quickly and easily applied to the axle of the car, where the force is concentrated so that a heavily laden car is easily moved. With this new car mover the labor of moving cars by hand is reduced to the minimum; it being self-adjustable to any build of car or truck, having instantaneous grip and release, quickly gaining momentum and retaining same when gained, can be worked between cars so as to open them up. and give the operator power to move a



A *B*

A—Shows position of Q & C Car Mover on axle to push car from operator.

B—Shows position to draw car towards operator.

car in either direction without change of position or operator. The construction of the car mover is such that the working faces are smooth, therefore the wear on same is nominal.

The working grip of the mover on the axle of the car is obtained by a sharp pull on the handle of the car mover, so that, with a little practice, the operator is enabled to take advantage of the momentum gained and thereby keep the car moving at a rapid rate of speed. With this mover it is possible for one man to move a loaded car quite readily and with comparatively little effort.

"Some Saw Suggestions" is the title of a catalogue just issued by the Q & C Company, Phenix Building, Chicago, descriptive of some of their specialties in saws, among which we notice a metal sawing machine especially constructed to meet the requirements of steam and street railroads, and rolling mills and foundries; also portable and small power sawing machines that have a wide range of usefulness.

Steam Heating Valve for Locomotives.

The Consolidated Car Heating Company has designed a special throttle valve to place on a locomotive for the purpose of controlling the connection by which steam is supplied to the train. This valve is made somewhat after the style of the valve furnished by the Westinghouse Air Brake Company for the purpose of controlling the admission of steam to the air brake pump. It, however, is made for 1 inch pipe instead of ¾ inch. It has a connection for the dry pipe, and is made very heavy and substantial.

This valve is also so designed that it can be placed in a horizontal position at the side of the boiler should there be found lack of space on top of the boiler itself. It is so arranged that the dry pipe connection may be made by the means of a bushing and entirely independent of the valve. This construction makes it so that the throttle valve may be placed directly on the boiler or at any other convenient position in the steam pipe.

The Consolidated Company has also put upon the market a dust guard for the Sewall coupler, which is most effective and simple. It is attached to the support chain of the Sewall coupler and when the coupler is not in use it holds the coupler up and closes the end.

The Whitney Contracting Chill.

A. Whitney & Sons, of Philadelphia, the well known manufacturers of cast iron wheels, have issued a pamphlet containing the report of the Master Car Builders' Committee on Cast Iron Wheels, together with the circular of inquiry received from the committee and their answers to the questions therein.

This company, as is generally known, uses the Whitney contracting chill, invented by the senior member of the firm, Mr. John R. Whitney. In answer to the committee's question if foundry or service records show any advantage in the contracting chill which is not had with the older form of fixed chills, this company replies:

"Both our foundry records and the records of wheels in service show decided advantages in favor of the contracting over the ordinary solid or fixed chill. While losses in casting due to faults of workmanship remain about the same as before the introduction of these chills, our losses from the ordinary variations of temper in the mixture of irons has been reduced fully 50 per cent. With the same grade of iron the chill is deeper and of very much more uniform depth all around the wheel, as, for instance, without hardening our mixture, we obtain in at least 90 per cent. of our wheels a chill of ⅜ to ½ inch deep uniformly all around the wheel at the root of the flange, while the same mixture if cast in the solid chill would have no chill at all, or a very slight one, in many places at the same point.

"As to the quality of the chill, specific gravity tests show that a cubic foot of the chilled or white iron produced by the contracting chill will weigh more than a cubic foot of the white or chilled iron produced from the same metal in the solid chill. The difference will vary from one to three pounds, according to the brand of iron tested.

"This is still further confirmed by the experience of our wheels in service. Reports from our customers certify that since the adoption of the contracting chill the mileage has increased from 25 to 50 per cent., according to the nature of the service and the condition of the road."

Mr. Stewart Hartshorn is again forced to enlarge his manufacturing facilities. A large brick factory building is nearly completed in Muskegon, Mich., and contracts are being given out for another of similar proportions in East Newark, N. J. The latter is to be connected by an iron bridge of sixty feet span to the main factory building across the street. The wire mill is running all night as well as day, producing the thousands of pounds of wire necessary for the daily output. Three factories, after many enlargements, are running full to meet the demand that was filled by the comparatively small original plant a few years ago.

The National Lock Washer Co., of 65 John Street, Newark, N. J., report that the National Lock Washer is giving universal satisfaction wherever used, and the demand for it is still on the increase. Notwithstanding the fact that the number of miles of new track laid within the last year has been much less than in former years, the new manufacturers have sold more of the National Lock Washers this year than ever before. It is coming into use in all places where it is desirable to keep nuts tight.

The Phœnix Steel Wire Broom and Brush Works, of Chicago, Ill., manufacturers of locomotive track brooms, report that they are receiving more orders for these brooms than ever before. They are in use on a large number of locomotives, and wherever used give good satisfaction.

The Huyett & Smith Manufacturing Company, of Detroit, Mich., has issued a neat little pamphlet descriptive of some of its apparatus used in heating prominent railroad shops and buildings; among others the Pennsylvania Railroad shops, at Meadows, N. J., containing 17,000 feet of pipe; and apparatus used by the Pullman Company, at Pullman, Ill., containing 10,000 feet of pipe.

A fair of the Massachusetts Charitable Mechanic Association is being held at Boston, and will continue until Dec. 3. The Builders' Iron Foundry have on exhibition a 12-inch breech-loading rifled mortar, weighing 3,200 pounds. The Brown & Sharpe Manufacturing Company make an exhibition of stock cutters, gears and gages, micrometer and vernier calipers, scales, squares, etc., also special cutters, hobs, etc., and samples of gear cutting, milling, grinding and screw machine work.

In all they exhibit 1,300 articles of interest to machinists.

The Webster, Camp & Lane Machine Company, of Akron, O., have issued a pamphlet descriptive of the Akron Corliss engine, which is built by this company, and is well adapted for manufacturing establishments, electrical stations and power plants generally.

The success that the O'Neil Crossing Alarm Co., of Cleveland, O., is meeting with in the introduction of its "Automatic Crossing Alarm" is phenomenal. Already 27 railroads have them in use. They are recommended by several railroad commissions and are inexpensive, and can be depended upon as being a safeguard against accidents on the public highway crossings.

The Mason Air Brake & Signal Company, of Chicago, has issued a catalogue which furnishes a complete description of the Mason Air Signal System as applied to passenger trains. The object of this system upon railway trains is to substitute for the old and unreliable bell and bell-cord a positive and absolutely reliable pneumatic signaling system, which will enable the conductor to transmit orders to the engineer from any part of a train. This system may be employed upon trains equipped with any automatic air brake system.

Our Directory.

Atlanta & Florida.—C. Gabbett has been elected President.

Bangor & Piscataquis.—A. Brown, Superintendent, has resigned.

Central of New Jersey.—C. J. Williams, Master Mechanic at Communipaw, has resigned.

Central Vermont.—C. F. Spaulding, Division Superintendent, has resigned, and will retire Nov. 1. C. E. Fuller has been appointed Superintendent of Motive Power.

Cleveland, Lorain & Wheeling.—L. W. Squire has been appointed Purchasing Agent.

Cornwall & Lebanon.—N. Irish has resigned on account of ill health.

Fitchburg.—J. Crandell, Superintendent of the Western Division, has resigned.

Fremont, Elkhorn & Missouri Valley.—E. Dawson has been appointed Master Mechanic, headquarters at Missouri Valley, Iowa.

Grand Trunk.—C. Stiff has resigned as Superintendent of the Southern Division.

Lake Shore & Michigan Southern.—J. Kirby, General Master Car Builder, has retired from that position.

Kansas City, Osceola & Southern.—C. V. Lary has been appointed Master Mechanic, vice W. E. Reeve resigned.

Mexican National.—W. H. Meally has been appointed Division Superintendent, vice J. L. Williams resigned.

Newport News & Mississippi Valley.—W. J. McKee has been appointed Superintendent, vice W. E. Morse resigned.

New York, Lake Erie & Western.—G. B. Ross, Master Mechanic, at Buffalo, has resigned. C. E. Fuller, Jr., Division Master Mechanic, has resigned.

Ohio & Mississippi.—J. W. Wells, Purchasing Agent, has resigned. J. F. Barnard, President and General Manager has retired, his successor having been chosen at the annual meeting, Oct. 13.

Philadelphia & Reading.—W. Bertolette succeeds C. M. Lawler as Superintendent of the Williamsport division.

St. Joseph Terminal.—J. S. Chambers has been appointed Master Mechanic at St. Joseph, Mo.

South Carolina.—G. H. Gramling, Master Car Builder, died at Charleston, S. C., Oct. 9.

South Florida.—J. E. Ingraham has resigned as President

NATIONAL CAR AND LOCOMOTIVE BUILDER

DECEMBER, 1892.

CONTENTS.

The Beech Creek Railroad is about to order ten locomotives.

The Great Northern has ordered 50 engines of the Brooks Locomotive Works.

The Central of Georgia has ordered 700 cars to be delivered by Jan. 1 next.

The Northern Railway of France is to build 1,100 freight cars of 22,400 lbs. capacity.

Compound locomotives are to be tried on the Bombay, Barodo & Central India Railway.

The shops of the Grand Trunk at London, Ont., were recently damaged by fire to the extent of $40,000.

Three compound engines are being delivered to the Rio Grande Western by the Baldwin Locomotive Works.

The Pennsylvania Railroad has contracted for 45 consolidation engines class "R", with the Baldwin Locomotive Works.

The Vanderbilt lines are taking the deadwoods off of their freight cars that are equipped with the Master Car Builders' coupler.

The Pennsylvania is considering the building of 5,000 freight and passenger cars for which contracts will soon be awarded.

The car shops of the Richmond, Fredricksburg & Potomac Railroad, in Richmond, Va., were burned Nov. 14. Loss, $20,000.

The management of the Old Colony Railroad is considering the erection of a new passenger station at Kneeland street, Boston.

The New York, New Haven & Hartford is putting up a new round house at Willimantic, as well as increasing the size of the yard.

W. P. Tuthill, M. E. Cale and George W. Bancroft have organized the Bancroft Vestibule Car Company under the laws of Illinois.

Receiver Comer, of the Georgia Central, has been authorized by the Court to purchase 1,000 new freight cars and three new compound locomotives.

The Philadelphia & Reading has ordered 50 engines of the Baldwin Locomotive Works. Half of these are to be compound engines with Woo ten boilers.

The Altoona shops of the Pennsylvania Railroad are engaged upon orders for 60 locomotives, the last 20 of which ordered are to be consolidation engines.

On Oct. 21, the date of the World's Fair dedicatory exercises, the Illinois Central carried to Jackson Park an average of 20,000 passengers an hour for six hours.

The Richmond & Danville Railroad has perfected arrangements with the Pennsylvania to operate their fast limited trains through between New York and New Orleans.

George Sontag, convicted of being concerned in the robbery of a Southern Pacific train at Rolinda, Cal., some time ago, has been sentenced to the penitentiary for life.

Eighteen thousand pressed steel ties, each weighing 100 pounds, have been finished by the Schoef Manufacturing Company of Pittsburgh, for the New York Central Railroad.

The New York Central is erecting fixtures for using compressed gas in all its new coaches, as well as equipping the old coaches at the rate of ten a week. The gas plant is at Syracuse.

Twenty-seven men in the English mercantile marine who were candidates for masters' and mates' certificates last year were rejected through their inability to distinguish colors.

The Great Northern is about to expend $250,000 in improvements in Minneapolis, and contracts covering all have been awarded. They include track lowering, filling in and grading and several highway bridges.

There was a collision between two freight trains Nov. 10, on the Louisville, New Orleans & Texas road, near Babo, Miss. It is reported that both engineers, who were instantly killed, were asleep when the engines came to gether.

An express train on the Santa Fe road was held up at Wharton, Nov. 9. The express car was blown open with dynamite, the messenger wounded and overpowered, and the safe robbed. The amount secured was several thousand dollars.

A broken wheel under the smoking car of an express train on the Atlantic & Pacific road threw the car off the track while on a trestle, and four other cars followed down a steep embankment. One man was killed and 13 badly wounded.

The Davenport, Iowa & Dakota road was sold at auction recently, and was purchased by the Burlington, Cedar Rapids & Northern company for $320,000. The sale was made to satisfy a judgment held by the Farmers' Loan and Trust Company.

Owing to the great scarcity of cars at the collieries in the Schuylkill Valley, the Philadelphia & Reading repair shops at Palo Alto and Schuylkill Haven have been ordered to work double time until further notice in order to supply the demand for cars.

It is reported that negotiations for the purchase of the Pratt & Whitney fine tool works by an English syndicate have been practically completed, and the plant will be in the control of the Englishmen within a short time. The terms of the purchase were $2,500,000.

A certificate of the consolidation of the Fitchburg Railroad of Massachusetts, the Boston, Hoosac Tunnel & Western Railway, and the Troy, Saratoga & Northern Railroad of New York, under the name of the Fitchburg Railroad Company, was filed at Albany, N. Y., Nov. 1.

Thirty coal cars were derailed and 20 badly wrecked on the Trenton branch of the Pennsylvania Railroad near Swedeland, Nov. 6. The accident was caused by an axle of one of the cars breaking while the train was crossing the Schuylkill River. Two men were slightly hurt.

A largely-attended negro convention was held at Atlanta, Ga., Nov. 17, to protest against the discriminations made against the negro race by such laws as the separate car law, which forces a citizen to pay first-class fare, and at the same time forces him or her to a third-class ride in a smoker.

The Wabash is making great preparations to secure a fair share of the World's Fair traffic. The Detroit extension is being pushed and an extra force of men has been presssd into service. The October earnings show an increase of $78,149 over the corresponding month in 1891.

A charter has been granted the Olean & Eastern Railway Company, in Pennsylvania, to build a line from Genesee Forks to Oswego, Potter County, Pennsylvania, a distance of 14 miles. The company, of which J. B. Ramsey, of Columbus, O., is President, has a capital of $200,000.

There is an iron bridge on the Buffalo, Rochester & Pittsburgh road which stretches across Cattaraugus Creek, near Springville, N. Y. The peculiarity about it is that it is in two counties and three towns. One end is in Erie County, town of Sardina, and the other end in Cattaraugus County, on the boundary line of the towns of Ashford and Yorkshire.

The British steamship "Thordisa" cleared Pensacola, Fla., Nov. 17, for Liverpool, with a cargo of 7,610 bales of cotton, weighing 3,805,398 pounds. This is one of the largest, if not the largest, cargo in proportion to tonnage that has ever left a United States port, and the result is due both to the extra quality of compressing and good work in stowing the ship.

On and after Jan. 1 the Adams Express Company will operate on all lines included in the Chicago, Burlington & Quincy system, a contract having been entered into between the two corporations. The Burlington lines east of the Missouri River have been operated by the American Express Company, and the lines west of the Missouri by Wells, Fargo & Company's express.

A dreadful wreck occurred on the Chicago, Milwaukee & St. Paul road Nov. 9, at Highland Center, a small station in Iowa. A fast freight dashed into the caboose of a local freight standing on the track, telescoping the caboose and four cars. The caboose caught fire and the scene which followed was heartrending. Four people were burned alive and a number of others had narrow escapes.

By the completion of the Atlantic Coast Line's "short cut" from Wilson, N. C., to Florence, S. C., via Fayetteville, the distance between Eastern cities and Columbia, Charleston, Savannah and Florida points has been reduced sixty-one miles. This, together with an increased rate of speed, agreed upon for this service, will cause material reduction of time between all points East and South via this line.

Experimental tests made at the Stevens Institute of Technology are reported to have shown that the Pintsch gas is capable of affording an illumination of 40 candle power continuously in an ordinary 4-flame lamp without requiring more than ordinary attention to the lamps, while the latest improved Argand burners, with oil, give only 8 to 16 candle power, showing a ratio of 2½ to 5 in favor of the Pintsch gas.

Henry Meyer, a stationary engineer of Alton, Ill., is the inventor of a switch protection which provides for an iron cage over the switch stand. Into this cage the switchmen must go in order to unlock the switch. The instant he throws the switch to the side track the cage closes and makes him a prisoner. He can only get out by throwing the switch back to the main track. An open switch in case of accident, will thus hold the party to blame where he can be found.

President Roberts, of the Pennsylvania, has spoken for his road regarding the rates of fare to be adopted by the various roads during the World's Fair, Mr. Roberts says his road will not make any cut on which to form a basis that other roads might follow, but will wait until the example has been set and then steps will be taken toward making low rates also. The Vanderbilt lines, and especially the New York Central, have determined not to make a higher rate than a fare and one-third for the round trip.

A new Union depot is to be built at St. Louis. When completed, the trainshed, which will be entirely of iron and glass, will be the largest in the world, having ample capacity for 32 full trains, all of which are to be backed in on the pocket system. This portion of the structure will cost $1,400,000. The depot proper will be highly ornamented, and will cost $500,000. The land, etc., involved in the matter cost in the neighborhood of $3,500,000. Thus the whole structure will represent an outlay of over $5,000,000.

There was a disastrous wreck on the Fort Wayne road at the Washington Avenue crossing in Allegheny, Nov. 1, when a fast freight from the East was run into by the Keystone express from Chicago, smashing six freight cars and badly wrecking an engine. In the confusion the fast express No. 1, bound for Chicago, was forgotten, and the train, running at high speed, crashed into the first wreck completing a blockade of three tracks. None of the passengers was injured, but the engineer and fireman of the West bound express were badly hurt.

The *Bulletin Official de la Marine* issued by the French Government gives instructions for the preservation of tubular boilers when not in use. They should be completely filled with water, the acidity of which has been neutralized by the addition of lime and soda. Externally the tubes should be painted, where accessible, with red lead or coal tar, but such parts as cannot be got at for this may be preserved by burning coal tar under them. The smoke of the tar is condensed in the cold tubes and forms there a protecting layer which prevents corrosion.

The sheriff of Duluth seized a passenger train on the Eastern Minnesota Railroad Nov. 3 to satisfy a judgment for $15,000 in favor of J. J. Moran. The engine, six coaches, a buffet car and two baggage cars were seized. The company borrowed coaches and an engine of the Terminal Company and got their train to St. Paul four hours late. Moran secured judgment for $12,000 for personal injuries received while in the employ of the company. The railroad appealed and Moran got judgment for $13,000 at the second trial. The interest brought the amount to $15 000.

Buffalo will soon be a center for the making of car wheels. George W. Miller, President of the Buffalo Car Manufacturing Company, is at the head of another car wheel concern, which has bought several acres of land lying between the Erie and Buffalo Creek tracks and Clinton and Howard streets for a site. The property is located close to the big plant of the Buffalo Car Manufacturing Company. Plans are now being made for the concern, which will be known as the Buffalo Car Wheel Foundry Company. The buildings will be of brick, and the plant will have a capacity of 500 car wheels a day.

Daniel Webster, speaking of the railroad tracks in 1840, said: "They are made of two stringers of scantling, notched into ties that often get loose in the ground. Upon the stringers two straps of iron, the width and thickness of wagon tires, are nailed. These straps of iron frequently get detached at the ends, which turn up like snakes' heads and pierce the floors of the cars." Such an accident actually happened to a car between Elizabeth and New York. "Then the wheels slip on the iron straps, in winter especially, so much that no dependence can be placed upon the time of arrival, and many people think that it is not certain that railroads will be a success."

Spanish Freight Cars.

We present herewith engravings reproduced from photographs sent to us by a correspondent in Spain showing the construction of two types of cars that are common on Spanish railroads. The box car (or "closed wagon," as our correspondent terms it,) was built for the Tarragona, Barcelona & France Railroad, (Ferro Carriles de Terragona, á Barcelona y Francia) by the Railroad Material and Construction Society of Barcelona, the largest railroad supply furnishers in Spain. The wheels of these cars are of forged iron with steel tires and have steel axles. The

A SPANISH BOX CAR.

body of the car rests on a frame of channel iron. The superstructure framing is of oak and the outside sheathing of red pine boards is put on vertically and tongued and grooved. The inside sheathing is of the same material laid longitudinally. The floor is also of red pine. These cars have a capacity of 22,000 lbs, and weigh 15,000 pounds. They are equipped with the Web brake. They are 18 feet 6 inches in length and 8 feet 2 inches in width. The open car of our next illustration was made by the same builders in Barcelona for the Economical Railway of Manresa & Perga, and was one of an order for 45 cars of various classes. These cars also have wheels of forged iron with steel tires and axles. The body of this car also rests upon an iron channel bar frame. The frame of the brakeman's box is of oak; all the rest of the woodwork of the car is of red pine. The floor boards are tongued and grooved, and the side boards are supported by stakes inserted in iron pockets. The brake arrangement is the same as on the box car described above. These cars weigh 6,000 pounds, are for one meter (3.28) gage, and carry 14,000 pounds of freight. They are 15 feet 9 inches long and 5 feet wide.

We quote from our correspondent's letter as follows:

The system of construction and the material employed in the wagons just spoken about, are those which are commonly employed by the principal of the rolling stock supply companies for their cars. In the passenger cars they make ordinarily the skeleton frame of the bodies with elm and selected oak, and the exterior of the roof is made with mahogany or teak, which is left in the natural state after a coat of varnish. Interiorly, the sides are fitted up with linings of red pine painted with fine woods or covered with tapestry, according to the class of the carriage. For the rest it is common to employ frames wholly of iron, with axles of steel and wheels with steel tires, and with the centers of the wheels of forged or stamped iron. Never are these centers made now of cast iron. The dimensions which are commonly adopted in the construction of coaches and wagons are the ordinary European ones, which vary between 5 and 8 meters in length, for a box width of 2½ to 3 meters. Nevertheless, they have begun already to introduce in Espana, the American system of long coaches mounted on bogies. The Barcelona Sociedad de Material Para Ferro-carriles have now in construction a good number of coaches of this class, of 11 m. 60 (37 feet 3 inches) in length, with the centers of the bogies at 7 m. 50 (24 feet).

The Baltimore & Ohio Railroad Company has placed an order for 60 locomotives with the Baldwin Locomotive Works of Philadelphia.

It is reported that the Pennsylvania company and labor organizations, which include in their membership the switchmen, trainmen and firemen, are at variance, both as regards wages and the recognition of labor organizations. The trouble has been brewing for some time.

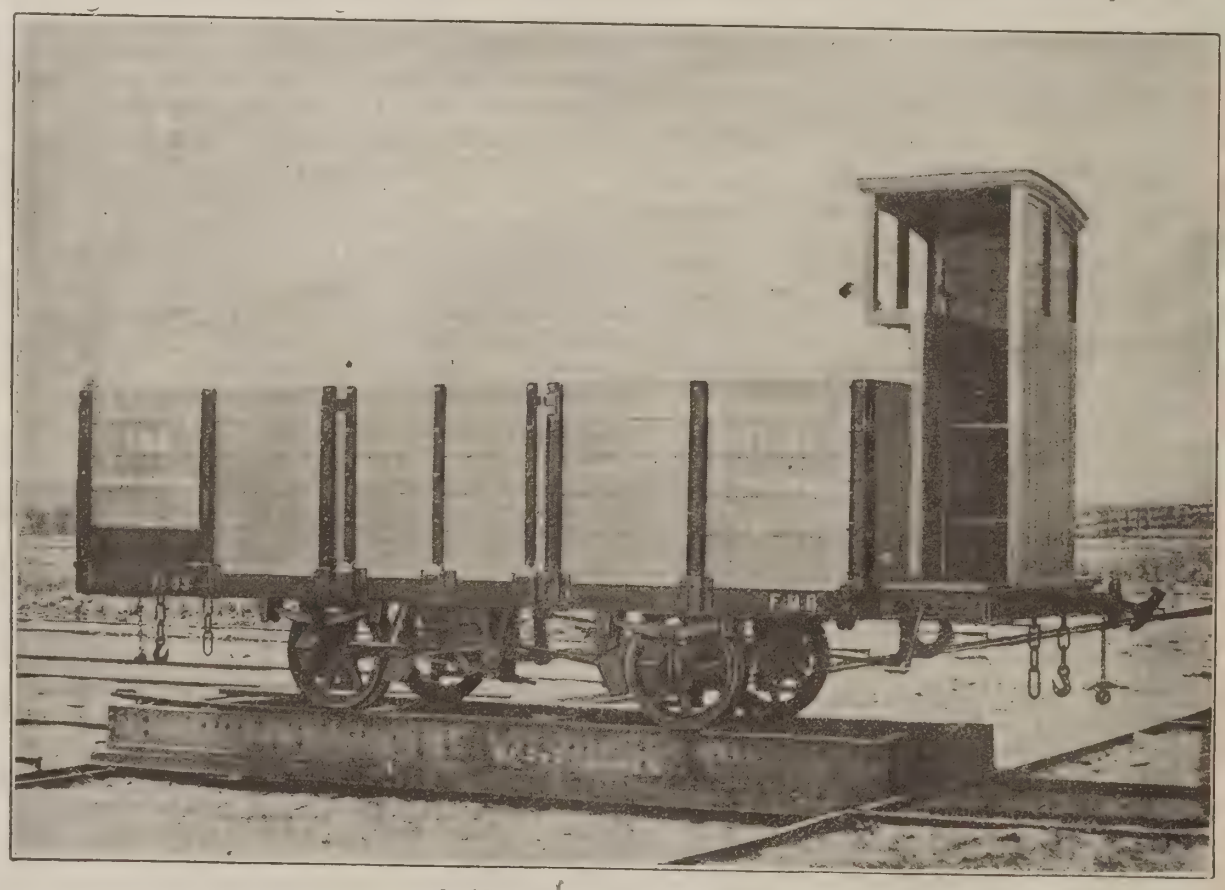
A Day of Accidents in England.

A rear collision occurred in England, Nov. 2, between the second section of an East Coast express train from Edinburgh to London, and a freight train, near Thirsk, Yorkshire. The signals were obscured by a thick fog, and the express ran into the freight train. The collision occurred about ten minutes after 4 in the morning. The freight train with which the express collided was loaded with iron Ten persons were killed outright or burned to death in the fire that started shortly after the collision and consumed part of the train. Thirty persons were injured, 12 very badly.

The collision was caused by a signalman falling asleep while on duty. According to his statements, as published in the daily press, he had passed the night attending upon his dying child, and after the child's death he asked the station master for leave of absence, but this was refused unless he could find a substitute, which he was unable to do, and thus went on duty tired out mentally and physically. When the collision occurred the express locomotive rebounded and turned partly around, falling in a field beside the track. The cars between it and the Pullman were all wrecked. The Pullman reared up and fell over upon the locomotive. The coals from the furnace of the locomotive set fire to the gas with which the train had been lighted. The flames spread slowly but surely, no organized attempt being made to check them.

One passenger went raving crazy while witnessing the flames slowly roasting his wife to death. He made several frantic efforts to throw himself into the burning pile and die with her, but was restrained by his fellow passengers, who, like himself, were unable to render any assistance to the unfortunate people caught in the blazing wreck Many denunciations of the apathy of the railway officials were heard. The first help from Thirsk, a distance of only two and a half miles, arrived two hours after the disaster, and even then no efficient appliances were furnished for clearing the wreck away or caring for the dead and injured. The whole affair shows that many improvements are required before English roads will be as well equipped as American to cope with such emergencies.

Another railway accident occurred the same night. A train on the Mersey railway, loaded with passengers, many of whom had been on the Birkenhead ferryboat, when it collided with the ship "Eurydice" the same evening, was leaving the ferry station when it ran into an engine and was badly damaged. Three passengers were killed and about fifty injured. When passage on another train was offered to the passengers who were unhurt, many of them having been in the ferryboat collision and the railway collision the same night, thought they had experienced enough of the risks of travel that day and refused to go.



A SPANISH GONDOLA CAR.

Schenectady Ten-Wheel Engines for Chicago & Alton R. R.

The Schenectady Locomotive Works will build 12 ten-wheel locomotives for the Chicago & Alton, similar to seven engines previously built for this road by the same works. The main dimensions are as follows:

Cylinders, 19 × 24 inches.
Drivers (6), diameter, 70 and 64 inches.
Driving wheel base, 12 feet 8 inches.
Total wheel base of engine, 23 feet 2½ inches.
Weight on drivers, 96,000 pounds.
Weight on truck, 26,000 pounds.
Weight of engine in working order, 122,000 pounds.
Weight of tender, loaded, 73,800 pounds.
Weight complete, 195,800 pounds.
Boiler (wagon top), Otis steel.
Boiler diameter, smallest, 58 inches.
Firebox length, inside, 90 inches.
Firebox width at bottom, 41¾ inches.
Flues (238), length, 13 feet, 10 inches; diameter, 2 inches.
Grate area, 26 square feet.
Total heating surface, 1,815 square feet.
Valves, Allen-Richardson balanced.
Tender capacity, 3,800 gallons.

Three Tornados.

The three most destructive storms of the year in the United States, consisting of three tornados starting from a common center and sweeping in different directions, occurred Nov. 17. The point from which the storms started was in the extreme southeast part of Illinois, about 18 miles from the Mississippi River.

Taking a southeasterly course, one part of the storm passed on rapidly through Western Kentucky and Tennessee, levelling everything in its path at Red Bud, Ill., and killing several people, and only when Northern Alabama was reached had it lessened its force. Another storm moved westward, passing through Central Missouri, thence across Northern Kansas. finally being lost in the mountains of Wyoming. The third section of this curious atmospheric disturbance took a northerly course through Iowa and veering west into Nebraska..

Much loss of life and destruction of property was caused by each of the tornados. The telegraph wires were blown down along the paths of each, and a passenger train on the South Park railway in Colorado was blown from the track and toppled over an embankment. Eleven people were hurt in this accident, but none fatally.

Two Competitive Locomotives.

The photographic reproductions herewith illustrate the general design of two compound 10-wheel passenger locomotives recently built by the Schenectady and the Baldwin locomotive works, respectively, for the Chicago & Northwestern Railway. The engines are now running on that road. They are similar in weight and general design, and at the present time are engaged in competitive tests to demonstrate their respective superior qualities. These tests

BALDWIN COMPOUND LOCOMOTIVE.

have not progressed sufficiently far as yet to warrant the officers of the road in drawing any comparisons or arriving at any definite conclusions.

The general and detail dimensions of both engines are as follows:

	Schenectady.	Baldwin.
GENERAL DIMENSIONS.		
Fuel	Bituminous coal.	Bituminous coal.
Gage of road	4 ft. 8½ in.	4 ft. 8½ in.
Total weight of engine in working order	128,700 lbs.	About 130,000 lbs.
Total weight on drivers	97,000 lbs.	About 96,000 lbs.
Total wheel base	22 ft. 8 in.	23 ft. 10½ in.
Driving wheel base	12 ft. 2 in.	12 ft. 6 in.
BOILERS.		
Working pressure per square inch	180 lbs.	180 lbs.
Style of boiler	Wagon top.	Straight top.
Diam. of first ring outside	58 in.	60 in.
Firebox, inside	95⅞ in. long, F 59¼ in. deep, B 56¼ in. / 40⅞ in. wide	109 in. long, 40¾ in. wide. 59⅛ in. F. 56¼ in. B.
Material and thickness of plates inside of firebox	Wellman steel, crown ⅜ in., tube ½ in., sides and back ⅝ in.	Homogeneous cast steel. The same.
Water space around firebox	4 in. all around.	3¼ in. sides, 4 in. front and back.
Crown staying	5 × ¾ in. bars welded at ends.	Radial staybolts 1⅛ in. Taylor iron.
Tubes, material	Charcoal iron No. 11 W. G.	Iron No. 11 W. G.
Tubes, diameter	2 in.	2¼ in.
Tubes, number of	247.	213
Tubes, length	12 ft. 6 in.	13 ft. 10 in.
Heating surface, tubes	1,605.8 sq. ft.	1,724.87 sq. ft.
Heating surface, firebox	130.7 sq ft.	114.58 sq. ft.
Heating surface, total	1,736.5 sq. ft.	1,839.45 sq. ft.
Grate surface	26.9 sq. ft.	30 sq. ft.
Grate, style	Rooking bars and drop plate.	The same.
Ash pan, style	With dampers front and back.	The same.
Exhaust nozzles	Single 4¾ in. di'm.	Double high.
Dry pipe	6½ in. inside di'm.	7½ in.
Smokestack	Straight, 14 in. inside diameter	Straight, inside diameter 18 in.
Boiler supplied by one	Monitor Injector No. 9.	The same.
" " "	A w/F " 8.	
CYLINDERS AND VALVES.		
Cylinders	20 in. and 30 × 24 in.	14 in. and 24 × 24 in.
Pistons	Cast steel, rings sprung in.	Cast iron, rings sprung in.
Piston rods (steel)	3½ in. diam. with guide on front end 3¼ in. diam.	Steel, 3¾ in. diam.
Piston rod packing (also valve stem)	U. S Metallic.	Sullivan Metallic.
Steam ports, high p. cyl	2⅛ × 19 in.	Circular, 24 × 1⅛ in.
Exhaust " " "	3 × 19 in.	Circular, 24 × — in.
Bridges " "	1⅜ in.	3 in.
Steam ports, low p. cyl	2⅛ × 21 in.	Circular, 1⅛ × 24 in.
Exhaust " " "	3 × 21 in.	" " "
Bridges " "	1⅜ in.	" 2¾ and 3 in.
Slide valve, greatest travel	Both 6½ in.	5¼ in.
Slide valve, outside lap	Both 1⅛ in.	H. P. ⅞, L. P. ⅝.
Slide valve, inside clearance, high pressure	⅛ in.	None.
Slide valve, inside clearance, low pressure	1/16 in.	None.
Slide valve, kind	Allen-Richardson patent balanced.	Balanced piston pattern.
WHEELS.		
Driving wheels	68 in. diam.	68 in. diam.
Engine truck, style	4-wheel rigid.	4-wheel center bearing swiveling.
Engine truck, wheels	33 in. diam.	33 in. diam.
Engine truck wheel spoke	Washburn, steel tired.	Midvale spoke, steel tired.
TENDER.		
Tender frame	Of angle iron 6½ × 4 × ¾ in.	Of oak and yellow pine with channel iron center strongly braced.
Water capacity of tank	4,000 gallons.	3,600 gallons.
Coal capacity of tank	7 tons.	6½ tons.

Negotiations are pending for the consolidation of the linseed oil interests of the United States. The plan of consolidation includes the National Lead and Linseed Oil companies as well as other outside concerns, representing in all about 85 per cent. of the industry.

Higher Speed of Railway Trains.*

BY C. A. M'ALPINE, SUPERINTENDENT NORTHERN DIVISION OLD COLONY R. R.

We are told that Stephenson nearly defeated his object when advocating the first steam railway by asserting that trains could be moved at the rate of 12 miles per hour. This was soon accomplished, and then began the cry for higher speed. To-day, with trains running regularly at 40 to 50 miles per hour, the cry still continues, and increases with the increase of speed. It is the duty of the railway manager to comply with all reasonable demands of the public. The public demands higher speed. Is it practicable to comply? If not, then the demand is unreasonable.

This being a body of practical men I shall assume that the question before us is, not what is possible, but what is practicable. In my opinion the question as to railway speed may be answered by saying that, within a certain limit of course, it is the speed which the public will pay for. When the public is willing to pay for a three hours' ride between Boston and New York it can be accommodated with as good a degree of safety as it now enjoys while making the journey in six hours. That locomotives can be built capable of attaining a speed of 80 or 90 miles an hour, with light loads, is beyond question, and we can conceive of a railway so constructed as to admit of such a speed with reasonable safety; but that such a road can be built and operated so as to render a fair return upon the capital invested I believe is not worthy of serious consideration at the present time, although it may not be out of place to mention a few of the reasons which, to my mind, render it impossible to attain such a speed, for a long time to come at least.

One of the most important things, perhaps the most important, to be considered when we start a train is our ability to stop it; Mr. George Westinghouse, Jr., tells us, that with a perfect brake acting upon all the wheels of an express train running at a speed of 90 miles an hour, at the end of 10 seconds after the application of the brake the train would still be moving at 60 miles an hour, and would have traveled 1,130 feet, and would be brought to a stand in about 1,200 feet more or 2,330 feet in all; while under the best actual conditions now existing, at the end of 16 seconds the train would be moving at 61 miles an hour, and would have travelled about 1,800 feet. With this fact staring us in the face it seems a waste of time to talk of running trains at such speed on our present tracks and in connection with the ordinary passenger and freight traffic. The question then is: Is it possible to put our present railways in condition to meet the necessary requirements, and if it is possible is it a practical proposition? To this first I would answer, yes; to the latter, no; I say no because there is no reasonable probability that it would result in a sufficiently increased revenue to warrant the outlay. The necessary changes in roadway and track would amount, practically, to the relocating and rebuiding of our roads.

Mr. Theodore Voorhees, an authority on high speeds, tells us that an ideal railway would be perfectly level and straight, with a roadbed and track heavy, substantial and well drained, with no grade crossings or openings to invite trespassers; with bridges whose floors should be as solid as the roadbed itself, and with stations so planned that no passenger could never set foot on the track. I would add to this that these tracks must be devoted exclusively to high speed trains and must be located at a sufficient distance from all other tracks and from each other to avoid the danger, ever present with us now, of an accident on one track causing a tenfold worse one on another. Add to this a perfect system of signals constructed with due regard to the capacity of the human eye and operated in connection with a mechanical device automatic and positive in its action, which will, in the event of a failure on the part of an engineman from any cause to obey the signal, bring our train to a stand before reaching the danger point, and with equipment constructed of the best material and under the most rigid inspection, and we may travel on such a track at 80, 90, or even 100 miles an hour with comparative safety. All of these requirements can be met, but only with unlimited capital, and I fear that none of us here will ever see the ideal a realization.

Leaving, then, the question of extraordinary speeds to theorists and the future, is it practicable to make any increase in the average express train speed on what may be termed our first-class railways? Assuming 40 miles an hour as the present general average and 45 miles an hour as a special average, can we increase this by say 25 per cent., making these 50 and 60 miles an hour and to what extent does it involve the ordinary or local traffic? What system and appliances are necessary to accomplish it? Is our roadway and track safe for such increase, and if not, can it be made so at a reasonable outlay?

Taking these questions in reverse order, roadway and track are first to be considered as being the first essential to speed.

Solid masonry, and iron and steel have taken the place of the loose field stone and wood in bridges and culverts; crushed rock and gravel that of loam and other inferior material as ballast, steel rails have been substituted for iron, the number of crossties largely increased, the weight and strength of the rail and of all parts of the track have been nearly or quite doubled; dangerous curves have been straightened, grade crossings are being abolished or more securely guarded, safety switches are almost universal, and the facing point is rapidly disappearing. With these and other improvements, made and being made, we may safely answer this question in the affirmative.

Taking next the question of appliances, the motive power would seem to be the first in order. Few outside of the men who have brought the modern locomotive to its present development realize the wonders of the machine or the enormous power developed daily. What future development is needed to increase its average train speed by 25 per cent. I will leave for these men to discuss, and answer; fully believing that it can and will be accomplished whenever demanded by the financial and operating departments.

I want, however, to bring up a question which has long been in my mind and is brought out forcibly by a series of tests and records made on one of the "Shore Line" trains between Boston and Providence, and which is a fair sample of express train service in New England. This train is scheduled to make the run of 44 miles in 65 minutes, including two stops.

SCHENECTADY COMPOUND LOCOMOTIVE.

Making the liberal allowance of 5 minutes for the two stops, it will be seen that it is only necessary for this train to make an average of 44 miles an hour, and yet it was found that on 7 of the 8 trips covered the speed during some parts of the run exceeded 70 miles an hour, and on one occasion reached 77½ miles an hour. There is nothing exceptional about this train; equal fluctuations will be found to be the rule, particularly in New England, from which it appears that with a locomotive capable of maintaining the average speed on the up grades, existing on nearly all roads, we may increase our average speed to 50 or 60 miles an hour without any actual increase in the rate we are daily reaching, and, owing to the fact that a train can be brought to a stop within a much less distance on an up grade than on a descending or level track with no increased risk. My question then is: Do we not want more power in the locomotive rather than more speed, and is it not possible to bring this about? Otherwise, does not an increase of 25% in the average mean a maximum ratebeyond

*Read at the November meeting of the New England Railroad Club.

the safety limit? In other words, can we not best increase the speed by making it more uniform?

Next in order and importance, after getting our locomotive to give us the speed comes the brake to control it. Notwithstanding the wonders already achieved, much remains to be done in this line; experiments have demonstrated that at 60 miles an hour the brake force should be double that usually employed; we must have that force and it must be applied to every wheel in the train, not excepting the locomotive trucks. One of our Boston roads has recently applied the truck brake to one of its locomotives with such good results that a large number have been ordered, its efficiency and value being demonstrated beyond question.

We must have an automatic device to regulate the brake shoe pressure according to the speed so as to avoid "skidding" of the wheels and consequent loss of efficiency, and all parts of the brake must be strengthened to withstand the increased force to be applied. For emergency stops we must have a sand jet operated simultaneously with the air brake. Devices to accomplish this are brought out for attachment to the locomotive; they should be perfected and attached to the cars as well.

Our next problem is to remove as far as possible every known danger from the path of our train, and guard against such as cannot be removed by the best known appliances.

At way-stations where passengers must cross the main tracks, overhead or underground passages should be provided and measures adopted to compel their use. Leading switches should be be removed except where they are an absolute necessity, and whenever allowed to exist should be guarded by an interlocked or electric signal, or by both. All sidings should have derailing switches at the fouling point, connected with the main track switch. Draw-bridges, junctions and all other points where the tracks are of necessity frequently broken and obstructed should have a system of interlocking switches and signals, and the entire line should be covered by some system of block signals, a pupose to which the electric track circuit seems best adapted as covering the widest range of possible dangers and being the least dependent on human agency for the faithful performance of its duty; in fact I look for improvements in the application of electricity that will make it the railway watchman of the future. All fixed signals should be uniform in form and meaning, and care should be taken not to multiply them needlessly; making it a study to remove or group danger points, whenever possible, rather than add to the number of signals.

For night signals electricity has proved itself far better and more reliable than the oil lamp and should be used wherever available.

Operating in connection with every fixed signal which is to be used for a stop signal we should have a device which will apply the brakes and bring our train to a stop whenever the signal indicates danger, independent of any action on the part of the engineman. Appliances of this kind are now being put to the test of actual service and that they will prove a valuable addition to our safety appliances, either in their present or an improved form, I have no doubt.

It would now seem that with these improvements and additional safeguards our train might go on its way in safety, but we have yet to meet and overcome one of our worst dangers, and one that has never received the consideration that it merits. This danger lies in the freight train, running, not on our track, but upon the track 7 feet or less away. Be our roadway and tracks as substantial as the hills, our drawbridges, junctions, stations, sidings and crossings ever so well guarded, our block system of signals ever so complete, our locomotives and cars perfect in their construction and equipment, yet in the face of an obstruction thrown on our track by a mishap to the freight, it all goes for naught.

Whenever a fast passenger train meets and safely passes a freight train running on the opposite track, and this happens many times a day on most roads, it narrowly escapes disaster. Many frightful accidents have happened from this cause and their number will increase with the increase of passenger and freight traffic and the speed of trains unless a remedy is applied; the remedy lies in one direction, and in one only; we must prevent the mishap of the freight train.

To do this we must raise the standard of our freight equipment. Quality rather than price must govern the selection of material for its construction; all old or weak cars must be discarded and the freight car made to carry its load with as much safety as does the passenger coach. The old-fashioned door which easily slips from its fastenings, and, often followed by a part of the contents of the car, falls to the opposite track, or against the side of a passing train, has performed its mission and must go; the sooner the better. Breaking apart of the train, that fruitful source of trouble, and, perhaps, directly and indirectly responsible for more accidents and delays than any other one cause, must and can be stopped or reduced to a minimum.

This may seem a bold statement, and I am aware that the coupler problem has not yet reached a point to warrant it, but I have yet to learn any good reason, financial or otherwise, why, pending the solving of the problem, freight cars should not be equipped with safety chains. Their application is simple and comparatively inexpensive, and I firmly believe that if applied to all cars they would more than repay their cost the first year in the saving of accidents and delays. If any gentleman present has ever tugged a draft chain through three feet of snow from the caboose to the twentieth car of the train he will agree with me.

Stringent regulations must be adopted and enforced to prevent overloading and improper loading of the cars, and better means provided for the securing of such freight as must be carried on open cars; in fact, wherever passenger and freight traffic are both conducted over the same or adjacent tracks equal care for their safety must be exercised. These, to my mind, are the principal physical and mechanical requirements necessary to higher speed.

But with all these requirements met, we are still dependent for success and safety on the loyalty of the men engaged in the service; I use the term "loyalty," because it expresses all that men should be, and it should apply to all ranks from General Manager down, He who is loyal to the company he serves, and to himself, will do his best under any and all circumstances and will have the interests of his employers at heart always.

More care should be exercised in the selection of men than has been hitherto. Applications for positions of responsibility on our roads, or from which promotions to positions of responsibility are made, should be in writing on a regular form accompanied by references; such applications to be referred to a standing committee composed of experienced officials from different departments with a representative employé from the department to which the application was made. The applicant's general character could then be investigated and, if found satisfactory, notice sent him to appear for examination, regular dates being fixed for the purpose. The committee, if satisfied of the man's fitness for the service, would forward a certificate to that effect to the proper head of the department, who would enter the application to be taken up in regular order as vacancies occurred. Examination should be made from time to time of employés in line of promotion.

Should such a plan be adopted its advantages would be felt in every direction; the intemperate and vicious would be kept out of the service; those well meaning but lacking in natural fitness would be saved from ultimate failure and disappointment which, by the way, is often postponed at a frightful cost of life and property; accidents would be reduced to a minimum, strikes would be unheard of, and with such material once enlisted and fairly treated, the tramp railroad man, the bane of the service, would disappear; and, not the least of all, a fearful load of individual responsibility would be lifted from individual shoulders.

What effect an increase of 25 per cent. in the speed of our express trains will have on the local traffic is an important consideration and can only be determined by the volume and character of the traffic. In many cases it will mean an equal increase in the speed of local passenger trains at least; otherwise local trains would have to side track and wait the passage of express trains; trains would become bunched and a general demoralization of the train service would result.

The speed of these trains can be increased, but the cost of such increase must be considered as vital to the question at issue, and in this calculation the rapid rate at which the train resistance increases with increased speed will cut an important figure. I do not know that the exact ratio of this increase has ever been determined, but the diagram given us by Mr. Forney is probably approximately correct. From this it appears that on a level track at 40 miles an hour the resistance is about double that at 25 miles an hour, and at 60 miles an hour it has again nearly doubled, being respectively 7, 13 and 25 pounds per ton.

I am alive to the fact that speed in all things is the order of the day, and I would not be counted as in the rear of the procession, but I do not want to see the dangerous experiment of higher speed without a proportionate advance in system and safety appliances.

Discussion.

Mr. Lauder: To my mind the greatest difficulty that exists to-day in making high speeds is that of getting the track to run on clear of obstructions. We have a track on our road which is safe enough to make much higher speeds than we do.

As Mr. McAlpine says, I believe this question of high speed turns upon the point whether the public will pay for it or not. I think a portion of the traveling public on certain lines would be willing to pay the increased price; but whether the general mass of travelers would be willing to have the tariff raised for this increase in speed is a problem I leave to others to solve. I think that any New England road to-day could probably increase its speed with safety provided it could have a clear track to run on.

Mr. Ellis: In the able paper of Mr. McAlpine I was glad to notice that he brought out the fact that the track is the foundation of this very high speed which is demanded. Most assuredly a good track is the first thing, and to keep it good will help the net returns to the railroad company. This point is apt to be lost sight of, and poor materials are sometimes put into a track, whereas true economy suggests that it should be built of only the best materials, and not for the present need only, but with reference to the future benefit of the road.

Mr. Marden: I presume that all our New England roads, in order to make their average time between points, are obliged to increase the speed of trains where it can be safely done far beyond the average. On the Fitchburg road, even on the curves, we often run up to 60 miles an hour. I don't think there is any economy in trying to run trains at an average of over 45 miles an hour under the present conditions of traffic. In order to obtain an average of 55 or 60 miles, we must have a most excellent roadbed, and tracks must be set aside for the use only of these fast express trains. That would necessitate having a four-track road. I think we should discourage high rates of speed in our railroad service until such time as the public may demand them and are willing to pay higher rates of travel, and the corporations should have a chance either to four-track their roads, or arrange to run only express trains on some of the tracks they have now.

Mr. Coughlin: There is one point with reference to high speed of railroad trains that has not yet been mentioned, and that is to diminish the atmospheric resistance to the train. In naval architecture the endeavor is by every possible means to remove every point of projection, every line which offers an obstruction in going through the water in order to attain high speed. Now, with the shape of the locomotive and the cars which we have to-day, in endeavoring to force them to high speed, the resistance offered by the atmosphere absorbs an enormous amount of power. A tugboat taking a scow or square-bowed vessel through the water has to expend a great deal of power to overcome the resistance. A man passing through the atmosphere does not turn his umbrella behind him. To diminish the atmospheric resistance to trains you have got to change the form of construction of the locomotive and cars. This can be easily accomplished, and if done all the litigation about the vestibule cars would be done away with. You can have not only the vestibule but the car made conical at both ends, so it would be comfortable, and much less resistance would be offered to the atmosphere. If one is carrying a board he does not present the broad surface to the wind, but the thin edge. The alteration of the shape of our cars and the abatement of all projections as far as possible are necessary to the attainment of high speed without the increase or waste of power.

Mr. Chamberlain: I think I must take issue with Mr. Marden as to discouraging the high speed of trains. There are now running trains between New York and Boston in five hours and forty minutes. While there may be a demand for faster trains between New York and Boston, New York and Philadelphia, New York and Chicago, there is coupled with that the consideration of the number of the patrons of the roads who are willing to pay for the increased cost of more rapid transportation between points of that character. I am firmly of the opinion that trains between New York and Boston will before long run in five hours, and perhaps in four and a half or four. I think the business demands this, and that there is a certain class of travellers over the lines I have mentioned who would be willing to pay for the increase of speed; there are train loads passing between New York and Boston who would pay ten dollars instead of five to save a couple of hours. Time is money to them. As Mr. Coughlin suggests, the cars will have to be differently constructed, they will have to be built upon other lines to cause less resistance to the wind, and also to curve more easily than they do now. I think the tendencies to increase of speed on various roads are very marked.

Mr. Marden: I do not wish to be understood as not favoring progress, and I don't object to high speed provided it can be attained with safety. The time on any of the trains between here and New York is not what I think would be called excessively fast; the average rate, even at five hours, would be less than 50 miles an hour. Fast speed, especially on curves, requires greater elevation for safety; but if we elevate our curves to accommodate trains running at 50 or 60 miles an hour, and at the same time, over those tracks have a large freight traffic going perhaps at 15 to 20 miles an hour, the wear of the rails is very much greater on account of this elevation than in other parts of the track.

With regard to our passenger equipment, there is one thing of vital importance, it seems to me; in order to make it comfortable for our passengers and more safe for our cars in running at high speed, and that is the way the cars are hung upon the truck in order to prevent oscillation on the curves. This requires a proper adjustment of the springs, and the proper bolstering of the truck, so that the car may be hung in the best way to overcome the oscillation; and in this connection the weight of the car is to be considered with reference to the speed the train is to make.

Mr. Graham: If we want to secure a high rate of speed why not build our engines and cars especially for that purpose, and have them light, which would enable them to stop and start more quickly and to run more easily?

Mr. Lauder: It has been suggested that the running of trains at high speed is a question of power. It is not a question of power at all. We have engines that will run at any required speed. It is purely a question of getting the track to run upon. If we had the track we could make the run to New York at 75 miles an hour. The locomotives and cars, as they are now constructed, would be equal to it. With regard to oscillation of cars, I think there is a remedy at hand in the vestibuled cars, which have very little oscillation. I mean the Pullman vestibuled cars, which are perfectly coupled together. The motion of the swing-beam in the truck provides for the oscillation that takes place. This absence of swaying is noticeable in our Fall River train, which is vestibuled throughout, and runs at high speed. I do not consider that the weight of the train is such a terrible bugbear as some seem to think. You have got to have material in your car to make it strong and hold it up. To get strength you have got to put in strong material, and it will weigh immensely.

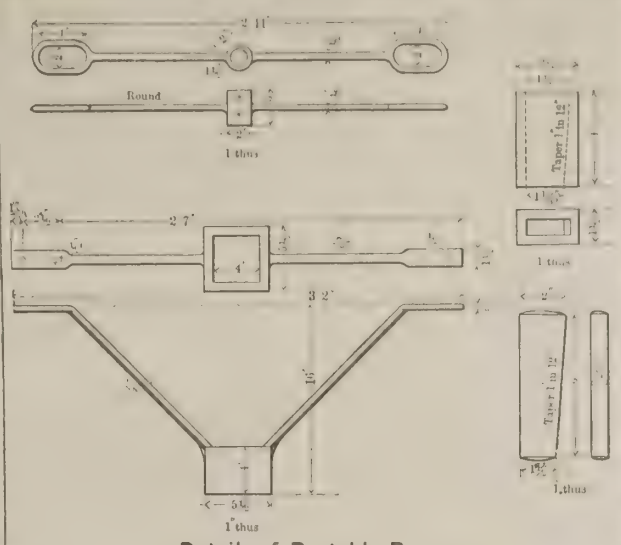
Mr. Adams: I think Mr. Coughlin is on the right line in what he said. I think that cars built in a square form, with the corners rounded would certainly offer less resistance than cars with square corners. There is no question that cars could be built so as to avoid oscillation, and I don't know but the round-cornered cars could be vestibuled as well as the square-cornered ones. If the ends were not on a regular circle in form, but more pointed, it might be better. Of course some room would be lost, but the buffers could be made as close and would accomplish the same results as on the present vestibuled cars, and the cars would run easier through the atmosphere.

Something has been said about lighter cars. We have a car on our road that has been running 14 years, and is in fair condition yet, which weighs only 30,000 pounds and carries 78 passengers; but such cars cost more money, and have to be built with more care. We have a number of drawing-room and sleeping cars that weigh 103,000 pounds each. If you put four or five of them on the tail end of a train, going up a heavy grade, the engine will puff hard and make very slow speed. The difficulty which has been mentioned in connection with the elevation of the track is a serious one. The elevation must be greater for high-speed trains than for low speed; and where passenger and freight trains are run upon the same track you can't get your curves adapted to both, and you have got to divide the difference; and the fast train will have to slow down at these points or go off the track. I think we have improved our road in that respect, and the cars curve much easier than they formerly did, and no shock is felt, and the wear upon the flange of the wheel is very much less.

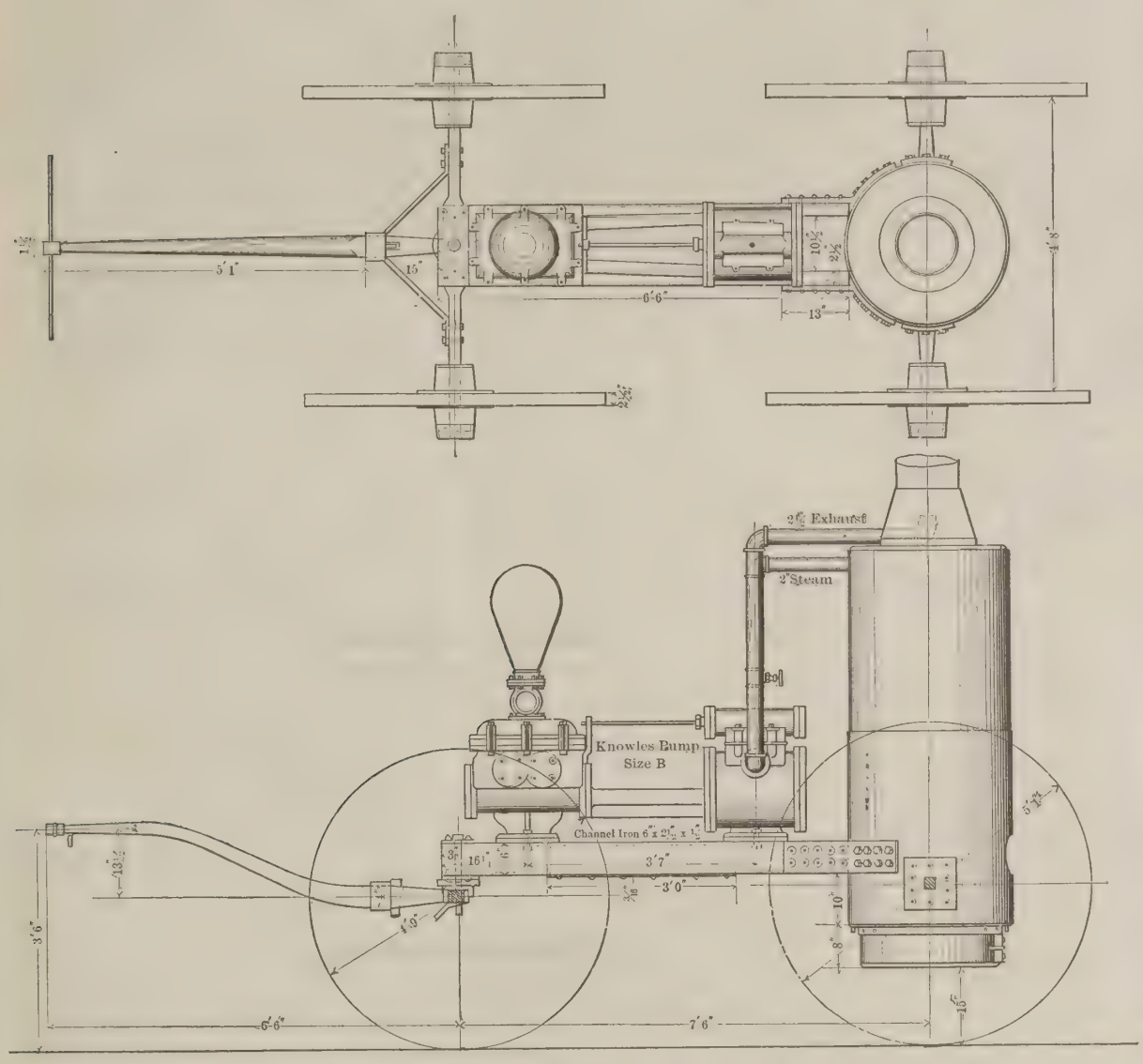
Portable Fire Pump, West Shore Railroad.

In the notes concerning the Frankfort shops of the West Shore Railroad, published in the October issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, mention was made of a fire engine and hose cart that were kept housed near the cluster of shops to be used in case of fire. We take pleasure in illustrating this engine, or portable fire pump, as Mr. Boon calls it, on this page; and we commend to master mechanics a consideration of the question if such a portable pump would not be a valuable adjunct to any plant of shops that is isolated from cities, and beyond the prompt reach of an efficient fire department.

As we mentioned before, this engine is always kept ready for immediate service, the water in the boiler being kept heated to about 150 degrees by steam conducted from the stationary engine boiler through a small pipe. Kindling and fuel are also kept on the grate ready for instant ignition, and a working pressure of steam can be raised in four minutes. A corps of frequently drilled attendants



Details of Portable Pump.



PORTABLE FIRE PUMP, WEST SHORE RAILROAD.

completes the requirements of an efficient fire service. The engine was designed by Mr. James M. Boon, and the illustrations herewith are reproductions of drawings kindly furnished us by him. They show so plainly the construction of the details and the arrangement of the parts that description is unnecessary. The boiler, which is a common upright tubular boiler, was one that was on hand and not in use. The pump is an ordinary Knowles pump, and was also an extra one. The frame and channel-irons were uninjured pieces of a broken tender frame; and everything about the engine, except the wheels which were purchased, was taken from material in stock.

One inch and $1\frac{1}{16}$ inch nozzles are used on the hose connected with this engine. The one-inch nozzle will throw a stream of water 100 feet, and the $1\frac{1}{16}$-inch nozzle will throw a stream 90 feet.

Railway Car Construction.

(From the Locomotive Firemen's Magazine.)

We have on our table a book of 176 pages, devoted to "Railway Car Construction." It is "a work describing in detail, and illustrating with scale drawings, the different varieties of American cars as now built." The publisher is William Voss, a master car builder, who some years ago wrote a series of articles on the construction of railway cars, for the NATIONAL CAR AND LOCOMOTIVE BUILDER, the purpose being to publish the articles in book form, which has now, after four years, been accomplished.

The work is divided into 24 chapters, with an appendix, beginning with "Freight Car Bodies," and ending with descriptions of "Standard Passenger Cars," including descriptions and drawings of the splendid Pullman and Wagner sleepers.

The locomotive firemen and engineers have their attention called more to the machine that pulls the cars than to the cars; still, if they have leisure, the study of car construction might be found profitable and interesting; at any rate, we apprehend there is nothing in the way of information relating to car building, from a freight car to a parlor car, moving over 165,000 miles of railway tracks, which cannot be found in Mr. Voss' book.

The American railway car, we are told by those who have made the tour of the continent, is the best in the world, and we have had reasons for believing that they could not be excelled.

We have seen illustrations of the prehistoric passenger car, the old time coach, the primitive affairs, something between a dry goods box and a wheelbarrow, and to examine some of the illustrations in Mr. Voss' book suggests evolution of railway cars as interesting as Darwin's theory of the evolution of man from a molecule or a monkey.

In a word, those who want to know all about car construction should address R. M. Van Arsdale, the publisher, Morse Building, New York.

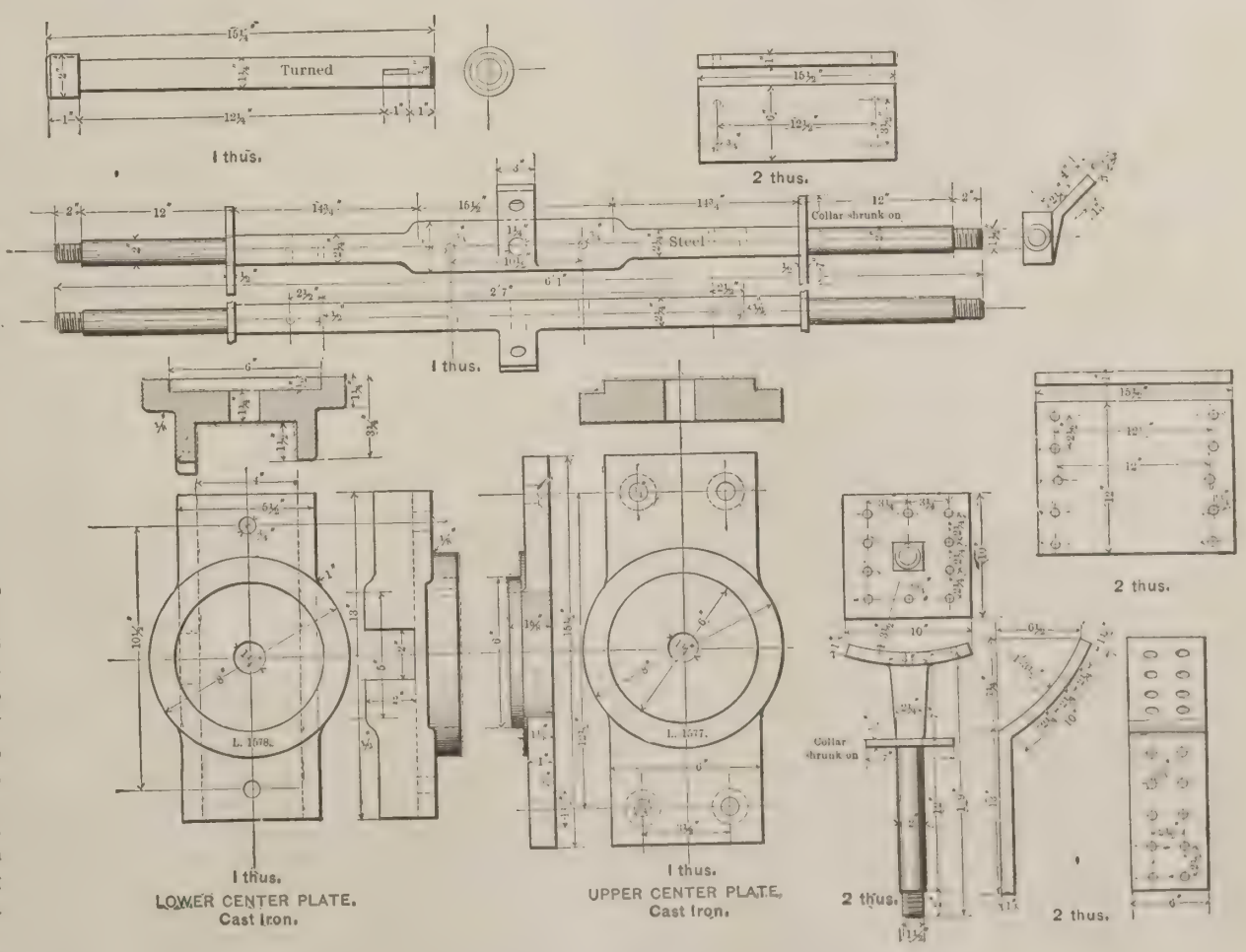
Boiler Explosion on the Philadelphia & Reading.

The boiler of a Philadelphia & Reading mogul engine with a Wootten firebox exploded Nov. 14, as a result of which five men were instantly killed and a sixth seriously injured. At the time of the accident there were on board the ill-fated engine, in addition to the regular crew, the engineer and fireman of another engine, who had finished their trip and were returning to their homes, also the conductor and front brakeman of the train.

All were instantly killed except the brakeman, who happened to be standing on the tender. One result of the explosion was to make five widows and ten orphans. It is said that the cause of the explosion was low water in the boiler. The force of the explosion was such that the boiler was torn bodily from the frame of the engine and hurled to one side of the track. The engine was a comparatively new engine, having been built by the Baldwin Locomotive Works about two years ago. It is reported that the engine was making its first trip after being withheld from service several days for repairs. At the time of the explosion there was considerable commotion among the occupants of the cab owing to the lagging beneath the jacket being on fire.

The Chicago, Burlington & Quincy, and the Chicago, Milwaukee & St. Paul roads have been directed by the Iowa Railway Commission to enlarge their depots at Council Bluffs. The Burlington is directed to erect a depot with a floor area of not less than 2,000 square feet and fitted with all conveniences for the traveling public within four months The St. Paul is given 60 days to construct an additional waiting room for a floor area of 800 feet.

The St. Paul & Duluth road now operates 360 odd miles of track, of which 183 belong to the company, the remainder being leased. During the coming year the most important work to be accomplished is the completion of the reduction of grades between Hinckley and Carlton to a maximum of 26 feet per mile, and the development of proper and independent terminal facilities in Minneapolis. The operating expenses for the fiscal year just closed were $1,234,617.62, as against $1,021,581.34 for the previous year. The surplus earnings amounted to $699,893.25, an increase over the previous year of $99,535.55.



DETAILS OF PORTABLE PUMP, WEST SHORE RAILROAD.

The Brooks Compound Locomotive.

The following engravings show some detail drawings and a photographic view of a ten-wheel compound engine, designed and patented by Mr. John Player, Mechanical Engineer of the Brooks Locomotive Works. This engine was recently built at these works, and was sold to, and is now in service on the Lake Shore & Michigan Southern Railway. This engine is designed to use bituminous coal, and the boiler, which is of the crown bar wagon top type, has 186 2-inch tubes, 12 feet long, and carries 180 pounds of steam pressure. The total weight of the engine in working order is 102,000 pounds, 75,000 pounds of which is placed on the drivers. The cylinders are 17 and 28 by 24 inches. The valves are of the Morse balanced type, with United States packing for the valve stems. A single nozzle 4½ inches in diameter is used. The inside diameter of the smoke stack is 13½ inches. The feed water is supplied by two No. 8 monitor injectors.

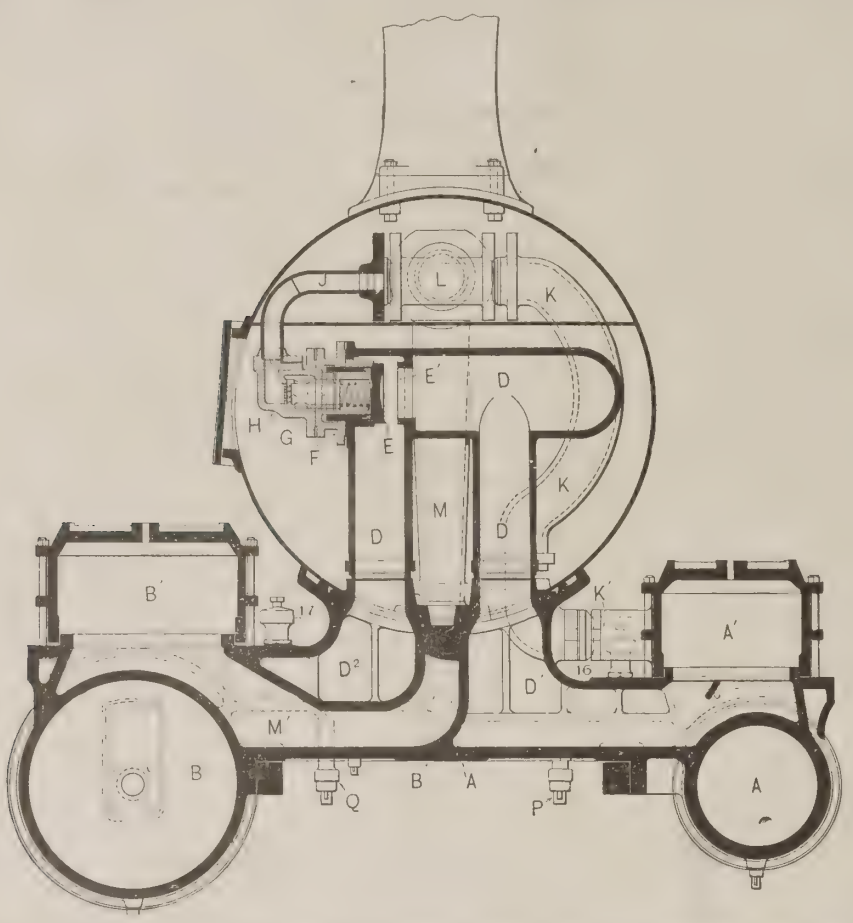


FIG. 1—SECTIONAL VIEW THROUGH SMOKEBOX AND CYLINDER CASTINGS.

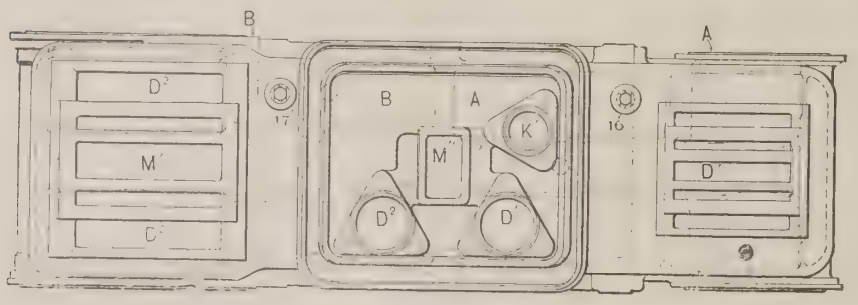


FIG. 2—PLAN OF CYLINDER CASTINGS.

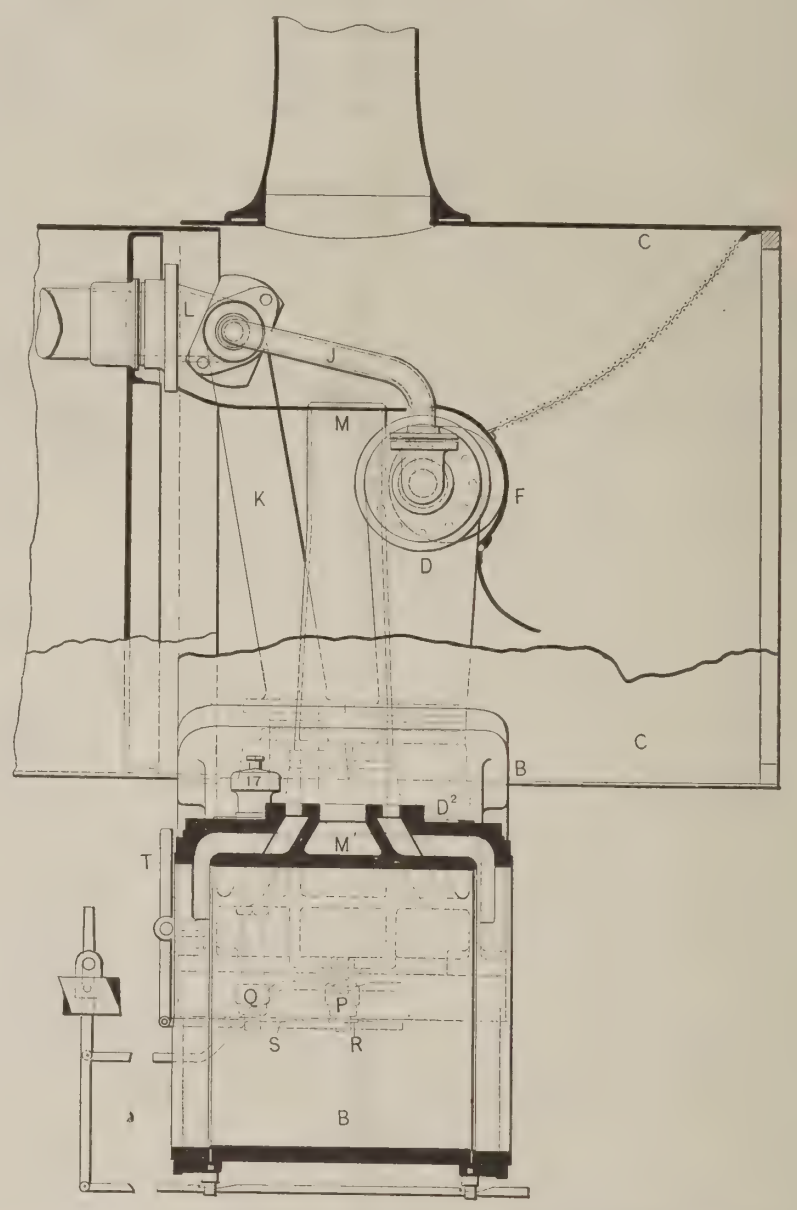


FIG. 3—VIEW THROUGH SMOKEBOX AND LOW PRESSURE CYLINDER

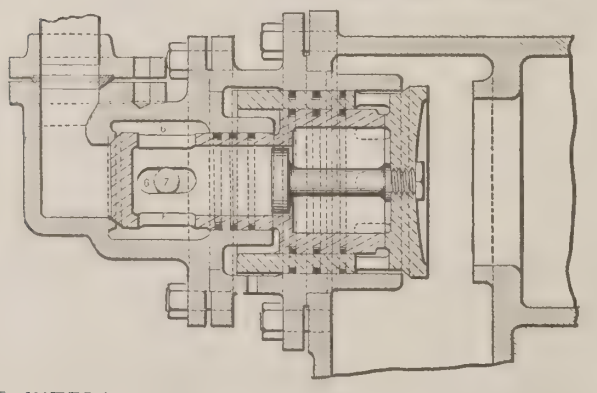


FIG. 5—INTERCEPTING AND REGULATING VALVES.

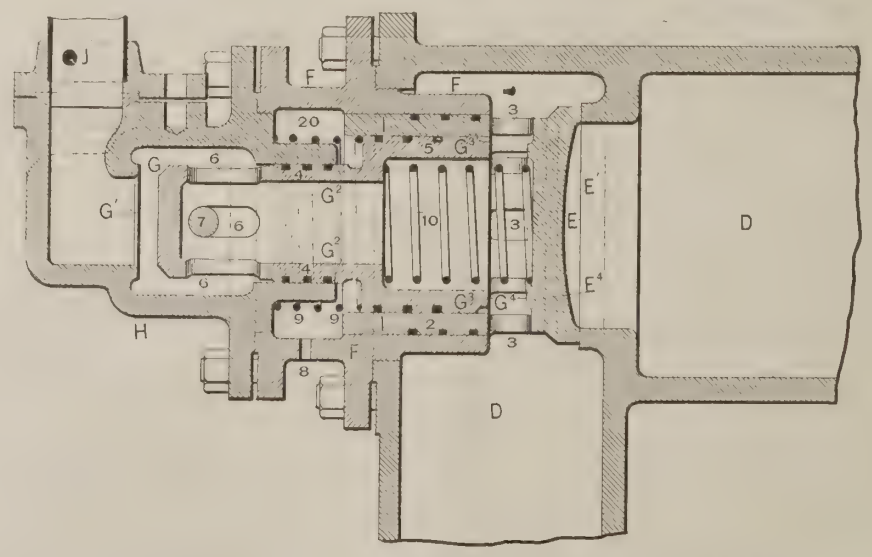


FIG. 4—INTERCEPTING AND PRESSURE-REGULATING VALVES.

Fig. 1 shows a sectional view through the smokebox and cylinder castings. It very plainly shows the arrangement in the smokebox of the receiver, and the intercepting and pressure regulating valves and connecting parts. Fig. 2 shows a plan of the cylinder castings. Fig. 3 shows a longitudinal sectional view through the low pressure cylinder and the smokebox, showing the receiver and intercepting valve located in the latter. Figs. 4 and 5 show the intercepting valve and pressure regulating valve in detail in different positions.

In Fig. 1 *D* is the receiver pipe and superheater, located in the smokebox and connected at one end to the exhaust port of the high pressure cylinder through the passage *D'* and at the other end to the admission ports of the low pressure steam chest through the passage D^2. These passages *D'* and D^2 are enlarged to the full area of each cylinder saddle in order to obtain the greatest amount of receiver capacity possible. *E* is the intercepting valve. Its casing *F* is located in the receiver pipe *D*. The valve closes against a seat *E'*. *G* is the pressure regulating valve, and *H* is its casing. *J* is the high pressure steam pipe, connecting with the T-head *L*, through which high-pressure steam is admitted to the pressure regulating valve. *K* is the steam pipe through which steam is admitted to the high-pressure steam chest *A'*. *M* is the exhaust pipe, connecting with the exhaust passage *M'* in the low-pressure cylinder saddle.

The intercepting valve shown is of the disc type, with an annular projection 1, forming a balancing device fitted with packing rings 2 and having slots or passages 3, through which the reduced high pressure steam passes into the receiver on the low pressure side. The pressure regulating valve *G* is an ordinary plug valve having hollow extensions G^2, and G^3, of different external areas, fitted with packing rings 4 and 5, working in its chamber *H* and in the interior of the annular extension of the intercepting valve, respectively. This valve is provided at its smaller extremity with passages 6, through which the high pressure steam is admitted into the interior of the valve and allowed to operate on the large end G^3, thereby reducing the pressure in proportion to the area of the part G^3 to the part G^2. The large end of this valve is provided with a seat G^4, which when the intercepting valve opens forms a steamtight joint with the similar seat E^4 on the intercepting valve, thereby allowing the whole area of the intercepting valve to become operative upon the reducing valve, keeping it closed when the pressure in the receiver *D* is considerably below the pressure which would be required to keep the reducing valve closed on account of the difference in areas of the valve itself, or, in other words, the excess of area of the intercepting valve is utilized to secure an increased difference in areas between the large and small ends of the reducing valve, thus keeping it closed under a lower pressure than is necessary for starting the locomotive. The travel of the pressure regulating valve is limited by a stop pin 7, which passes through a slot in the valve, thereby preventing the pressure regulating valve from having the full travel of the intercepting valve and also preventing the pressure regulating valve from closing on the seat of the intercepting valve when the intercepting valve itself is closed, so that the full area of the passages 3 in the intercepting valve may be utilized for the passage of the reduced pressure steam into the receiver on the low pressure side. The intercepting valve chamber *F* is provided with a leakage hole 8, whereby the differential areas of the intercepting valve and of the pressure regulating valve may at all times be exposed to the atmosphere in order to secure their proper working. This leakage hole is provided with a check valve which is used to prevent the too rapid closing of the intercepting valve when steam is admitted through the pressure regulating valve. It also serves to prevent the chattering of the intercepting valve when running without steam. Formerly the pressure regulating valve was provided with a stiff spring, shown in Fig. 4, which operated against the large area of the valve and was intended to keep the valve

off its seat when the throttle was closed. The intercepting valve was also provided with a spring, which operated to keep the intercepting valve against its seat when the engine was at rest. In practice, however, it has been found that these springs were unnecessary, and in order to secure a more sensitive action of the pressure regulating valve a cut-off plunger (shown in Fig. 8) is provided, working within the cavity of the pressure regulating valve. This plunger is of such area that when steam is admitted to the small end of the pressure regulating valve it opens the valve until it reaches the limit of travel against the stop 7, when the steam passes through the passage 6 and operates upon the plunger, thus causing the intercepting valve to close against its seat, and also forms a cut off edge, which renders the pressure regulating valve more sensitive.

The engine has controlling valves, the use of which provides for the control of the engine in starting and moving short distances the same as a single locomotive. These valves are ordinary flat valves, operated by slotted rods, connected to a suitable lever in the cab, and having inclined slots, arranged as in ordinary cylinder cock riggings. One valve is attached to the bottom of the receiver on the high pressure side and the other valve is attached to the bottom of the receiver on the low pressure side of the intercepting valve.

These valves are connected to a suitable lever in the cab of the locomotive. The engineer when desiring to move the locomotive a short distance moves this lever so as only to open the valve attached to the high pressure side of the receiver. This valve is of sufficient area to allow the exhaust steam from the high-pressure cylinder to pass out into the atmosphere instead of accumulating in the receiver and finally causing the intercepting valve to open. While this valve remains open the locomotive is operated as a single expansion engine, the whole amount of steam used in the low-pressure cylinder being admitted through the pressure-regulating valve. When it is desired to stop the locomotive in any position the controlling valve lever is moved into its farthest position. This causes the valve on the low-pressure side of the receiver to open as well and allows the escape of any steam collected therein after the throttle valve has been closed. These valves can also be used when starting to allow the escape of condensed steam from both sides of the receiver. The valves allow the admission of air to the receiver, and subsequently to the low-pressure piston, when the engine is running with the throttle shut.

A distinguishing feature of the intercepting valve of this engine is that it does not leave its seat at the first exhaust from the high-pressure cylinder, but remains seated until the pressure on both sides of the receiver is approximately equal, thus preventing any sudden reduction of pressure in the low-pressure cylinder and consequent loss of power. This enables the engine to exert great power in starting.

The general *modus operandi* of the apparatus may be briefly described as follows: When the throttle-valve is opened, live steam is admitted to the high-pressure steam-chest through the steam-pipe *K* and passages *K'* and operates upon the high-pressure piston in the ordinary manner. At the same time steam is admitted to the high-pressure end of the pressure-regulating valve through the connecting pipe *J*, causing the valve to open, and, passing through the slots 6 and thence through the hollow portion of the valve, causes the intercepting valve to close against its seat. This steam flows through the passages in the intercepting valve into the low-pressure end of the receiver, and, acting upon the large end of the pressure-regulating valve, causes it to partially close as soon as the requisite pressure is obtained, and thereafter regulates the amount of steam admitted by the pressure-regulating valve. The steam admitted to the receiver acts upon the low-pressure piston in the ordinary manner. As soon, however, as the high-pressure cylinder has exhausted sufficient steam into the high-pressure end of the receiver to overbalance the intercepting valve this valve opens automatically, at the same time locking the pressure-regulating valve against its seat. The exhaust steam from the high-pressure cylinder flows through the receiver and acts directly upon the low-pressure piston.

The following gives some further particulars of this engine:

THE BROOKS COMPOUND LOCOMOTIVE.

Gauge	4 ft. 8½ in.
Wheel base	23 ft. 3 in.
Driving wheel base	13 ft. 3 in.
Rigid driving wheel base	8 ft. 0 in.
Steam ports, high-pressure cylinders	16 in. × 1⅝ in.
Exhaust ports, high-pressure cylinders	16 in. × 3 in.
Steam ports, low-pressure cylinders	20 in. × 2¼ in.
Exhaust ports, low-pressure cylinders	20 in. × 5 in.
Width of bridges, high and low-pressure cylinders	1½ in.
Maximum travel of valve, high " "	5¾ in.
" " " " low " "	7 in.
Inside lap of valve, high-pressure cylinders	⅝ in.
" " " " low " "	1⅜ in.
Inside clearance of high-pressure valve	3/16 in.
" " " low " "	¼ in.
Lead of high-pressure valve in full gear	1/32 in.
" " low " " " " "	⅛ in.
Diameter of driving wheels outside tire	56 in.
Diameter of truck wheels	28 in.
Main crank pins	4½ in. × 6 in.
Intermediate coupling rod pins	5¼ in. × 4¼ in.
Front and back coupling rod pins	3½ in. × 3½ in.
Diameter of boiler, first ring outside	52 in.
Boiler material	Steel.
Thickness of plate	7/16 in., ½ in., 9/16 in.
Horizontal seams, quadruple riveted lap joints.	
Circumferential seams, double riveted.	
Size of firebox	96 in. × 34 in.
Ratio of high to low pressure cylinder	1 to 2.81
Ratio of high-pressure cylinder to receiver	1 to 4.5
Smallest diameter receiver passage	7 in.
Diameter of intercepting valve	7 in.
Smallest diameter of reducing valve	3 in.
Inside diameter of live steam supply pipe to reducing valve	2¾ in.

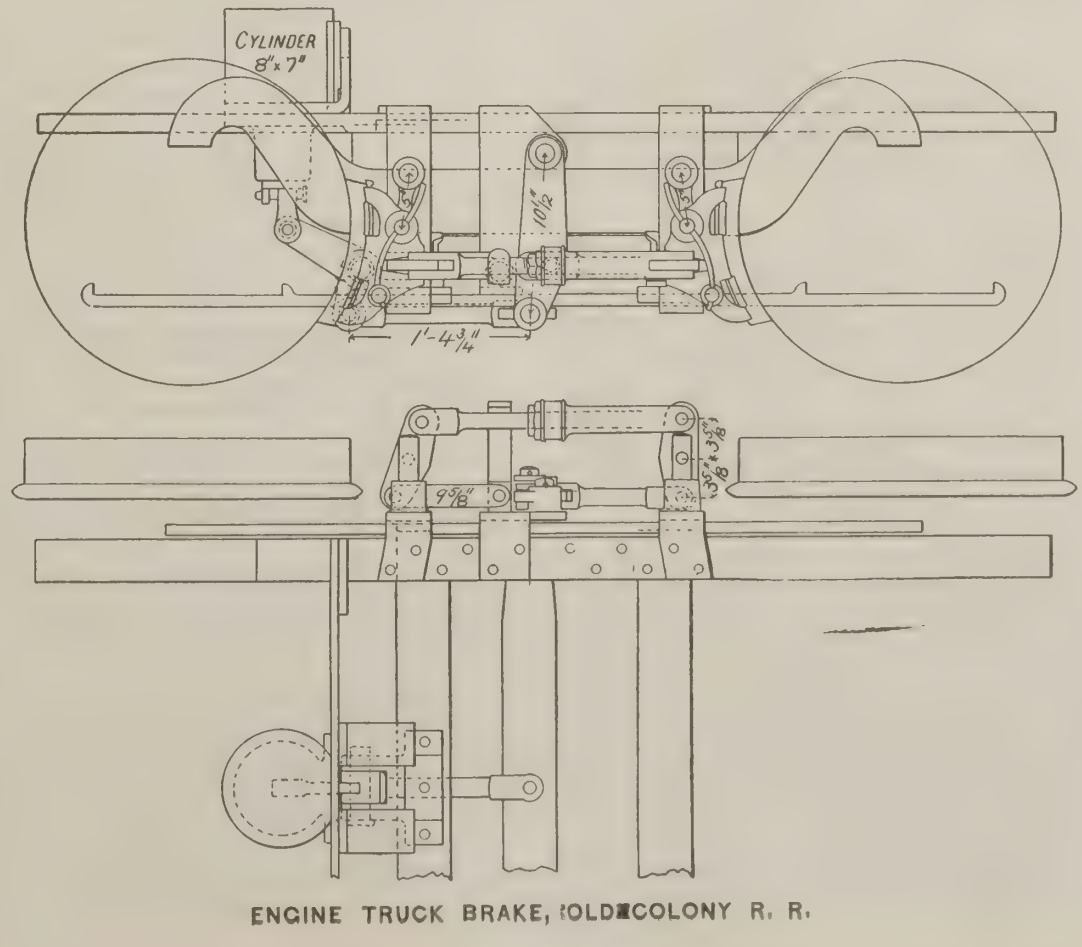
The car house of the Lindell Electric Line, in St. Louis, was burned Nov. 21. The loss will reach $150,000. Only one motor was saved.

An Engine Truck Brake.

The engravings herewith show the application of a brake to the engine truck as used on the Old Colony Railroad during some recent tests. The application being designed and furnished by the American Brake Company. It will be seen that a separate cylinder is used for the truck application. The engravings show the connection between the cylinder and the shoes, the slack adjuster, etc. The weight on the truck is 34,630 pounds, and the braking power 26,000 pounds. The results upon the Old Colony have led the Boston & Albany to order several equipments, and it reported that the Old Colony Railroad has decided to use the brake on the trucks of its passenger engines.

In the tests mentioned a decided gain in stopping the engine itself was made by using this brake, but with the addition of cars the gain was much less noticeable. The speeds at which the stops were made were about 30 miles an hour throughout the series of tests. With the lone engine, cutting in the truck brake reduced the length of the stop by 143 feet; with two cars added the reduction was 126 feet, with five cars added the reduction was 39 feet; all applications of the brake upon which these figures are based were service applications. In the single emergency stop test made there was practically no gain shown.

By a gas explosion at the Edgar Thomson Steel Works at Braddock, Pa., recently, two men were fatally burned. The molten material in the lower part of one of the furnaces had all been run out, and gas collected in the opening. When it became ignited an explosion resulted, blowing off the whole upper part of the furnace, upon which the two men were at work. They fell into the molten metal.



ENGINE TRUCK BRAKE, OLD COLONY R. R.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

LOCOMOTIVE BOILER EXPLOSIONS.

About a year ago the remark was made at a railroad club meeting that locomotive boiler explosions were of rare occurrence. In commenting on the remark we took occasion to say that there were four locomotive boiler explosions that month. Thinking possibly that some master mechanics may not be aware of the frequency of locomotive boiler explosions, and therefore underrate the danger of their occurrence, we have made it a point ever since to publish an account of every such boiler explosion we learned of. This being the last number of the twenty-third volume of the NATIONAL CAR AND LOCOMOTIVE BUILDER, the annual index accompanies this issue. By consulting this index it may be learned that we have recorded the following explosions: One on the Debardelben Coal and Iron Company's Railway, killing two men; three on the Philadelphia & Reading, killing ten men; one on the Chicago & Alton, killing two men; one on the Missouri, Kansas & Texas, no one killed; one on the Long Island road, killing three men; one on the Illinois Central, seriously injuring two men; one on the Pennsylvania & Northwestern, killing two men; one on the Georgia Central, seriously injuring no one, although six men were on the engine; and one on the Iron Mountain, killing two men. Our record is probably incomplete, as we have depended on the daily press dispatches for our information. It is bad enough as it is, however, the eleven explosions recorded resulting in the death of twenty-one men and the serious injury of two. In 1891 there were 22 locomotive boiler explosions in the United States, with probably a proportionate accompanying fatality.

The Philadelphia & Reading had three explosions this year to one on each of the other roads named above. Each of the explosions on this road occurred with Wootten boilers. The investigations of a coroner's jury showed that one of the explosions was due to defective stay bolts; the cause of another has not been reported, and the cause of the third, an account of which is published in this issue, was probably low water, as it is reported that the crown sheet "was burned a deep blue color to a line showing just how high the water had been when the explosion occurred."

This is the seventh Philadelphia & Reading locomotive that has exploded within the last two years; the others being—one at Columbia Avenue, Philadelphia; one at Tamahend; two on the Frackville branch; one on the Mine Hill branch, above Minersville; and one near Gordon.

It is asserted by those most familiar with the Wootten type of boiler that it is a safe and reliable form of boiler construction in addition to being very economical. However true this may be, or whatever is the cause of these accidents, the fact remains that this road and this type of boiler is gaining an unenviable notoriety for frequent and disastrous explosions.

It is probable that most of the explosions recorded resulted from broken staybolts, low water and excessive pressure. Excessive pressure is often carried in violation of orders from the mechanical department in order to do some task of work assigned by the train department. Sticking a packing iron or some other tool between the coils of the safety valve spring, when not inclosed, is a too common practice of some reckless engineers, so that the steam pressure can be increased sufficient to make some extra heavy pull or get up some hill without doubling. Several explosions occurred this year while the engines were engaged in heavy work, pulling or pushing trains up hill; and while it would be improper to say that they were probably carrying an excessive pressure, either in obedience to or violation of orders, our experience would suggest that inclosed safety valves that cannot be easily tampered with on the road are a cheap expedient to prevent this very dangerous practice.

It is well known that low water is a prolific cause of explosions. Locomotive and saw mill engineers alike sometimes forget their water, through carelessness or the pressure of other duties and responsibilities. It is something that cannot be rectified with the men themselves, as of course they appreciate the gravity of the matter, but, being human beings, they sometimes become absorbed in thoughts quite remote from their present duties. Two heads are better than one to watch the water in a locomotive boiler, and there should be two; one acting as a check upon the other. We have previously dwelt upon the desirability of water gage glasses (see page 60, April issue) for promoting economy in management and safety in boiler feeding, and we can but repeat that these glasses are an effective check upon the engineer, for with them there are two men watching the water level instead of one, as when gage cocks alone are used. Their use should be extended, and all locomotives in which the engineer and fireman are separated should have a water glass in the cab for the engineer and one conveniently placed for the fireman.

This brings up the question again, discussed on page 76 of our issue for last May: Who should feed a boiler? While previously discussed as a question of economical management it is yet a pertinent question in discussing safety in boiler feeding. We believe the fireman, contrary to general custom, is the best man to feed the boiler, and quote the following from our previous remarks on this subject:

With the responsibilities necessarily placed upon the engineer of getting his train safely over the road on time and watching the track, the signals, his engine and his train, he is often so absorbed in attending to these imperative duties that the feed of water to the boiler is neglected to the serious detriment of fuel economy.

On the other hand, the necessary condition of the fire (especially in soft coal burning engines) and the work of the fireman is really governed more by the feed of water to the boiler than by the working of the engine. They are the two conditions of locomotive management that most necessarily go hand in hand, each depending upon the other. This being true, it follows that such mutually dependent conditions should be treated by one man, and he the fireman. He has no duties to call his attention away from managing the fire and regulating the boiler feed to secure the best results, and as neglecting his injector would generally add greatly to his labor, he would always have the most effectual inducement to give it proper attention.

As to the responsibility for the safety of the boiler, the fireman could be made equally responsible with the engineer; neither is under bonds, and neither has more at stake than his personal safety, reputation and position. We have no doubt that if the responsibility were placed upon the firemen they would generally acquit themselves as creditably as the average engineer, and with the engineer reponsible, as he now is, for his whole engine, there would be an added assurance of the safety of the boiler.

Broken staybolts are probably responsible for as many boiler explosions as all other causes combined. Eternal vigilance is the price of safety in this matter, and daily inspection is the surest safeguard. In this connection we publish the rules for boiler inspection recently adopted by a large road previously having frequent boiler explosions that have ceased entirely since the inspection called for by these rules was inaugurated.

(1). All new locomotive boilers must be tested with hot water at pressure of 25 pounds above working pressure, and be calked tight under this pressure before going into service.

(2). Old boilers will be tested when in shop for repairs, at a pressure of 15 pounds above the working pressure. The temperature of the water should be nearly 212 degrees and the boiler heated up to this temperature before the test commences.

(3). The gage used in pressure testing must be connected for comparison with the test gage of tool room.

(4). A special examination of staybolts of locomotives in service must be made once a month. Inspectors will use special care in seeing that the holes in the staybolts are thoroughly cleaned.

During the inspection there must not be less than 30 pounds steam pressure on the boiler.

(5). A locomotive having one or more staybolts broken in the top row, or two or more in any other row, must not remain in service.

(6). The holes in the ends of all staybolts must be thoroughly cleaned out when engine is in shop for repairs.

(7). These rules apply to all boilers, whether at shop, on main lines, or at outlying points.

(8). Each Master Mechanic must keep a record of boilers tested and inspected, giving the age of the boiler, the date tested and inspected, the name of the inspector and remarks on the general condition of the boiler.

Two of the boiler explosions occurring this year took place while the engines were standing, and while no one was near them. One of these was on the M., K. & T. and the other on the Philadelphia & Reading. The engine in both cases had been standing some time. This presents another phase of this subject that it may be well to touch on here. It not infrequently happens that, as in the cases just cited, a boiler explodes after the engine has been standing some time and the steam pressure has fallen a number of pounds. This fact formerly gave rise to the belief among many that mysterious influences are often at work in locomotive boilers that result in disastrous explosions under unexplainable circumstances. It is not now believed by well informed men that there is any mystery about such explosions, they being simply cases that come under the head of some one of the ordinary causes of explosions previously discussed; or, if not, then due to an unnoticed accumulation of heat in the water within the boiler made possible by its having become purged, through boiling, of air.

All water in the normal state contains a quantity of air in solution. Freezing totally excludes this air, and the same thing may be done by long-continued boiling. This has the effect of making the water very cohesive, and of making the particles cling together, or to a substance with which they may come in contact, with great tenacity. Water in this state can be raised many degrees above its normal boiling point without ebullition; but when it does boil the excess of heat stored up causes it to do so with the force of explosion. This is a well known characteristic of water, and may account for such explosions as those mentioned. In such cases it is possible that after the engine has stood some time with no injection of fresh water the boiler water assumes more or less of the state described, ebullition ceases, the steam pressure falls, but all the time heat is being communicated to the water from the fire which should normally cause a constant production of steam, but in this case does not, and is stored in the water until, because of some disturbance or change, it causes an explosive production of steam that rends the boiler.

It would seem that the best way to guard against the the possibility of such action is to not permit engines to stand idle any great lengths of time, when "hot" and fired up, without the occasional injection of fresh water.

HIGHER TRAIN SPEEDS.

On another page we publish a paper on "Higher Speeds of Railway Trains," read at the last meeting of the New England Railroad Club by Mr. C. A. McAlpine. In many respects this is one of the best papers on higher train speeds that has been published, and it discusses a larger number of the many features of the problem than any of its predecessors. It is becoming very apparent to even superficial students of railway affairs that an era of higher speeds on all roads between important commercial centers is about to be inaugurated; and it is becoming equally apparent that the higher speeds that railroads will attempt to give their patrons, and that will be demanded by the latter, will call for improved conditions in every branch of the operating department of the roads. The locomotive has demonstrated its ability to make the highest desirable speed under favorable conditions, practically 100 miles an hour, the speed of 97 miles an hour having been recently attained as mentioned on another page. It may be said that the locomotive is in advance of the other features of the problem, although there is yet much room for improvement in its construction and operation.

Improvements in the roadbed, track and bridges, tending toward greater strength and rigidity and toward the straigthening of curves and the lowering of grades, constitute a now recognized important factor in the problem of higher speeds. The best system of block signals will be none too good; and we believe with Mr. McAlpine that "operating in connection with every fixed signal which is to be used for a stop signal we should have a device which will apply the brakes and bring our train to a stop whenever the signal indicates danger, independent of any action on the part of the engineman." President Haines, of the American Railway Association, expressed practically the same belief in his annual address before the Association, saying: "There is another step which may yet be taken, that of protecting the trains against the misconduct or neglect of trainmen themselves, by the introduction of appliances connected with the block signals which shall strike the engine gong or blow the whistle, or apply the brakes, or even close the throttle valve of the approaching train. The last year alone furnishes a most harrowing record of wrecks and the slaughter and maiming of passengers caused by signals obscured by fog, and engineers asleep at their posts or confused as to locality by fog. With higher speeds the importance of stop signals certainly operating to stop trains will increase. But the highest efficiency of signals and brakes can not overcome the necessity for separate tracks for fast trains on crowded lines.

The necessity of improving the freight equipment as a necessary precaution against accidents that may affect the safety of not only the freight train, but also of the passenger train on the opposite bound track a few feet distant, is a point touched upon in the paper mentioned, and

it is a subject of great importance concerning the safety of the passenger service on all double track roads. It illustrates how interdependent the operation of a busy road is upon the efficiency of every department and branch of the service; and how much depends upon the quality of every article that goes to make up the rolling equipment, from a locomotive to a car wheel; and in the selection of employés.

Reducing the resistance of trains is an element in the problem of higher speeds that has as yet received but little consideration, although in the future, and we trust the near future, it will surely be recognized as one of the chief ways of possible improvement. In building a ship that is intended for fast speed as much care and skill is exercised in designing the hull so that it will glide through the water with as little resistance as possible, consistent with the requirements of the service, as in designing the boilers and propelling mechanism. In building a car that is intended for the same kind of service on land that the ship is at sea the skill of the builder is confiined, by custom, to a type of construction that aims only at strength and the accomodation of the occupants. Although, at the speeds this car must run, the resistance of the air exerts proportionately as much of a retarding influence as the water the ship passes through, the builder's art ignores the condition. Of course the shipbuilders' art is older than history, while the birth of the car builders' is yet within the memory of living men. In the matter of designing a craft so as to avoid as much as possible the retardation of the element it navigates, the new can learn much of the older art.

It is a truth that coming generations of railroad men will perceive clearer than we can, that while we boast of the rapid progress and improvement made in railroad rolling stock, which really seems marvelous to us, we have been working along crude lines and stumbling very often into error. The advance has been chiefly in larger and heavier cars, and heavier and more powerful locomotives to pull them. Efforts to meet the needs of increasing travel and traffic by increasing the accommodation without increasing heaviness and necessary power have been few and faint hearted. The expedient generally employed has been the clumsy one of strength and weight and power; instead of skill, force.

It is safe to predict a new era that will be hastened by the call for higher train speeds, in which the elements that combine to retard the speed of trains, whether of dead weight, journal box friction, wheel friction or air resistance, will receive much more consideration than ever before.

CONSISTENCY OF LUBRICATING OIL.

As winter is here and the cold weather is reducing the number of cars that can be hauled per train, we desire to again call attention to the chief cause of the increased resistance of trains to being hauled in winter. As fully explained in our remarks upon the subject on page 26, February 1892 issue, it is due to the viscosity of the congealed oil in journal boxes. The colder the oil the greater the viscosity, and the greater the viscosity the greater the friction of the sticky layers of oil adhering to the journals and bearings. The remedy is in the use of the lightest grades of lubricating oil, or oil diluted, preferably with kerosene, for all bearings exposed to cold.

While experimenting with a full-sized model of a car journal and bearing which was running in a shop to determine some questions that had arisen relative to the action of oil and waste in railway service, it was observed that the viscosity of ordinary journal lubricating oil at low temperatures caused particles of waste to adhere to the journal and be frequently drawn up under the brass. While this tendency may not sensibly increase the train resistance unless the particles make a lodgment between the brass and journal, it was found that when such lodgment is effected a "hot box" is the inevitable result.

This may explain some heretofore curious cases of "hot boxes" in very cold weather where the bearing appeared all right and there was an abundance of oil in the box. Lubricating oil should always be in a liquid state to be most effective in reducing friction.

NAMING COMPOUND LOCOMOTIVES.

On another page we illustrate and describe in detail the compound engine recently built by the Brooks Locomotive Works. In our caption to the descriptive article we call this engine the "Brooks compound." It might be more properly called the "Player" compound, after its inventor, Mr. John Player, as the Baldwin and Schenectady makes of compound engines are frequently and very properly spoken of as the "Vauclain" and "Pitkin" types respectively, to do a just honor to the names of their distinguished inventors. Simplicity, however, is a great virtue in any walk of life, but with locomotives and especially compound locomotives it becomes a crowning virtue. The different makes of locomotives in this country are known by the names of their respective builders. This is the popular and simpler way and should extend to the different types of compound engines, which have enough to do in their struggle for supremacy over simple engines without being loaded with compound names.

HARMONIOUS AND HARSH TONED WHISTLES.

There has been a good deal of complaint recently concerning the nuisance of locomotives whistling within the limits of large towns, and in many cases where the railroad authorities were disinclined to have the noise abated the people have invoked the aid of the courts, and, in some cases, the State Railroad Commission. The agitation of the matter simply shows that people are getting tired of listening to the discordant shrieks of the ordinary locomotive whistle. In any well regulated yard whistling is entirely unnecessary, and the more progressive roads are forbiding the use of the whistle in large yards, especially when they are situated near the residence portion of large towns.

As whistling is regarded as annoying to people who reside near where much of it is done, it is a wonder that it does not occur to some roads that use loud and discordant whistles on their passenger engines, that the same are often annoying to the passengers who must ride for varying lengths of time, between an hour and several days and nights, within a few car lengths of such whistles and hear their unpleasant shrieks for stations, crossings and signals. Having used such whistles for many years, and, therefore, being well used to their sound we do not believe we are over sensitive concerning the same; but, while traveling, we have often been awakened and kept awake at nights by possibly the necessary use of a very disagreeably sounding whistle. At such times we have had some very decided thoughts on the superiority, from the passenger's standpoint, of soft-toned whistles. To the observant traveler the difference in the tones of whistles used by different roads is very noticeable, and the soft or musical toned whistles are very much the most agreeable.

While so much money and talent is expended by the passenger department in soliciting patronage, and by the operating department in selecting courteous crews, and providing in various ways for the comfort of patrons, it would seem that the mechanical department could help along considerably by adopting harmonious toned whistles for passenger engines. On double track roads all engines should be so equipped, or very explicit orders should be given and enforced prohibiting freight trains whistling while passing passenger trains.

Books Received.

Light Locomotives.—Seventh Edition, Pages 169, H. K. Porter & Co., Pittsburgh, Pa.

This is a little book devoted principally to descriptions of light locomotives of which the publishers are the manufacturers. It also contains much miscellaneous information concerning coal mines, coal roads, coke ovens, compressed air locomotives, cost of operating locomotives, and much else of interest. It is sent free by the publishers to those interested in such matters.

Abstract of Decisions of the Arbitration Committee of the M. C. B. Association, by J. D. McAlpine, Price 10 cents.

This is a little pamphlet of 12 pages, which gives an abstract of the decisions of the M. C. B. Arbitration Committee from cases 1 to 123 inclusive.

The author is the shop clerk of the C., C., C. & St. L. Ry., at Cleveland, O., and his object in compiling the work was largely to afford car deparment officers a convenient and ready reference to cases similar to any doubtful ones that they may have under consideration.

It is intended, however, more especially for use of car foremen and inspectors, as it embodies the substance of the decisions so concisely that it affords them an opportunity, with but little study, to become thoroughly familar with all the decisions pertaining to interchange business, thus preventing many disputes arising from lack of knowledge of rulings upon similar cases.

Simple Lessons in Drawing for the Shop. By Orville H. Reynolds. 83 pages. Cloth bound. Price $1. The Debs Publishing Co., Terre Haute, Ind.

This is a little book designed, as its name implies, to furnish simple lessons in drawing to shop men and others who are willing to make an effort at self-improvement in this direction. It is written by a practical railroad draftsman, Mr. O. H. Reynolds, Chief Draftsman of the mechanical department of the Northern Pacific Railway.

The book is profusely illustrated and is written in plain and simple language well within the understanding of those for whom it is intended.

In the first chapter the author gives some excellent advice that applies to every young man in railroad service, especially in the mechanical department: "Preferment comes to him who is qualified for it; the dullard remains in the rut, and it would seem as though that grim fact ought to be a sufficient incentive to make the thinker burn the midnight oil, which he must do if his educational advantages are limited, or if he expects to keep up with the procession. Anything that has the least bearing on the occupation should be read, and, not only that, it should be studied until the subject is thoroughly understood."

The Debs Publishing Company is engaged in the very good work of pushing the sale of good books on matters of locomotive operating, air brake practice, mechanical drawing, etc., among train, shop and enginemen. It is a work that will result in improving many of these men and fit them for the promotion that will almost surely come when they are ready for it, as well as benefiting the roads they serve.

The Record of Train Speed Broken.

On page 61 of our April issue we recorded the unprecedented feat performed by engine No. 385 of the Central Railroad of New Jersey running a mile in 39¼ seconds, or at the rate of 91.7 miles per hour. This engine has again broken the record, like Nancy Hanks, and can justly lay claim to being the fleetest thing on wheels in the world.

On Nov. 18 it made a mile in 37 seconds, and the next succeeding one in 38 seconds. Engineer Henry Beck, who made the previous record with the engine, was at the throttle, and Fireman David Blake was attending to the steam pressure, which was kept at 180 pounds.

Between Columbia Avenue, Philadelphia, and Wayne Junction the 385 ran 40 miles an hour on a spurt. Three minutes were consumed here, and the train then started on its 85-mile run to Jersey City. Before much speed was developed there was a slow down for Tabor Junction, where the tracks join those of the old North Penn. Road. Between Tabor and Jenkintown the train was flagged, and the grade up hill was 78 feet to the mile; five miles of the distance was covered in four minutes.

There was some fine running between Jenkintown and Langhorne, thirteen miles apart. The schedule was 14 minutes. The start was made out of Jenkintown two minutes late, and shortly after the train was under way a mile was made in 44 seconds. Between Somerton and Parkland, a distance of five miles, the longest time for a mile was 42 seconds, the first mile being run in 42, the second in 41, the two following miles in 40, and the last mile of the spurt in 42 seconds. This speed was between 86 and 90 miles an hour. The five miles were made in 205 seconds, which broke all records for a five-mile run, being 87.8 miles per hour.

After passing Neshaminy all previous records were broken and the 385 reduced her own unsurpassed run of 39¼ seconds for a mile to 39 seconds.

Bound Brook was reached on time, but on pulling out the train was flagged and when Plainfield was reached was three minutes late.

"Now watch her," said Engineer Beck, as he flew by Fanwood. The mile post was just beyond the station and the chronograph snapped as the engine shot by, and the long split-second hand started around the dial. It was this mile that was covered in less time than was ever traveled in, and when the next mile post shot by in the rear the time on the dial was 37 seconds, 97.3 miles per hour. The train flew on with unabated speed and the chronograph was snapped as the next mile post was passed. The time for the two miles was exactly 75 seconds. This made the greatest record for one and two miles, as the performance between Jenkintown and Langhorn did for five miles.

[It is reported that there was no preparation whatever made for the test. "A more unfavorable time could not have been chosen, as the rain poured in torrents during the day and only ceased half an hour before the time scheduled to leave Philadelphia—5.15 p. m."

But is it true that this was an unfavorable time for such a test of speed? In our opinion it was a most favorable opportunity. But for that drenching rain we might not now record this unprecedented performance. The rain wet the rails and the lubricating quality of water acted to greatly reduce the rolling friction of the wheels upon them. The reduction of this friction was the same as an addition of power in the locomotive, and the speed attained in consequence should suggest some thought concerning this form of friction and its action in increasing the resistance of trains.—EDITOR.]

New York Railroad Club.

The annual meeting of the New York Railroad Club was held Thursday evening, Nov. 17. The following officers were elected: President, R. C. Blackall, Superintendent Motive Power Delaware & Hudson Canal Company; First Vice-President, George W. West, Superintendent Motive Power New York, Ontario & Western; Second Vice-President, A. E. Mitchell, Superintendent Motive Power New York, Lake Erie & Western; Third Vice-President, W. H. Lewis, Master Mechanic Delaware, Lackawanna & Western; Secretary, J. A. Hill, Editor *Locomotive Engineering*; Treasurer, C. A. Smith, Union Tank Line.

It is estimated that the outlay for additional rolling stock and motive power by the Chicago roads to handle World's Fair business will not fall far short of $7,000,000.

HAD AN ENGAGEMENT.—Railroad Superintendent (climbing on to the engine)—That bridge ahead is very weak, but by putting on all steam I think the train can pass it. Engineer—All right; but if I were in your place I'd take a seat in the last car. Superintendent—I? Oh, I'm going to get off.

One hundred and nine thousand locomotives are at present running on the earth. Europe has 63,000, America 40,000, Asia 3,000, Australia 2,000 and Africa 700. In Europe, Great Britain and Ireland take premier position with 17,000 engines, Germany has 15,000, France 11,000. Austria-Hungary, the second largest continental country, has 5,000, Italy 4,000, Russia 3,500, Belgium 2,000, Holland and Spain 1,000 each, Switzerland 900, and the remaining European states 2,600.

Personal.

Mr. Henry H. Horton has resigned as Master Mechanic of the Florida Midland.

The Erie has ordered a hundred new vestibuled passenger coaches for use during 1893.

Mr. C. B. Bowen has been appointed General Manager of the New York & New England Railroad.

Mr. C. R. Fitch has been appointed General Superintendent of the New York, Lake Erie & Western.

Mr. J. W. Wells has resigned as Purchasing Agent of the Ohio & Mississippi, and that office has been abolished.

Mr. H. Cooper has been appointed General Foreman of the New York, Lake Erie & Western shops at Hornellsville, N. Y.

Mr. O. Fairhurst, Master Mechanic of the Brooklyn Elevated Railroad, has resigned, and is succeeded by Mr. E. M. Hedley.

Mr. W. N. Schoff, Assistant Purchasing Agent of the St. Paul & Duluth, has been appointed Purchasing Agent of that road.

Mr. Charles Hayward has been appointed Purchasing Agent of the Milwaukee, Lake Shore & Western, with headquarters at Chicago.

Mr. F. H. Brydges, Second Vice-President of the Manitoba & Northwestern Railway, has resigned, and the position has been abolished.

Mr. Michael Burke, formerly General Superintendent of the Mississippi & Tennessee railroad, died at Memphis, Tenn., Nov. 11, after a long illness.

Mr. W. R. Baker, formerly General Superintendent and Treasurer of the Manitoba & Northwestern Railway, has been appointed General Manager.

Mr. William B. Hatch has been appointed Purchasing Agent of the Central Vermont, vice Mr. David Mackenzie, appointed Division Superintendent.

The office of P. Bruner, Superintendent and Purchasing Agent of the Cleveland, Lorain & Wheeling, has been removed from Lorain to Uhrichsville, O.

Mr. A. W. Quackenbush has resigned the position of Superintendent of Machinery of the Chicago & Alton Railroad which he has held for several years.

Mr. John Ortton, Superintendent of Machinery and Rolling Stock of the Toledo, Kansas City & St, Louis, has resigned and is succeeded by Mr. W. P. Cook.

Mr. Isaac Bond, Foreman of the Susquehanna shops of the New York, Lake Erie & Western, has succeeded Mr. Ranson as Master Mechanic of the shops at Hornellsville.

Mr. C. C. Keenan, formerly of the Pittsburgh Locomotive Works, has been appointed General Foreman of the Western New York & Pennsylvania shops at Olean, N. Y.

Mr. W. J. Robertson, formerly Superintendent of Motive Power of the Central Vermont, has been appointed Master Car Builder of that road. His office is at St. Albans, Vt.

Mr. H. A. Childs has been appointed Acting Master Mechanic of the eastern division of the New York, Lake Erie & Western Railroad in place of Mr. C. E. Fuller, resigned.

Mr. F. R. F. Brown has been appointed Mechanical Superintendent of the Intercolonial Railway, to succeed Mr. H. A. Whitney, retired. Headquarters, Moncton, N. B.

Mr. C. S. Mellen, formerly General Manager of the New York & New England road, has resigned and accepted the Second Vice-Presidency of the New York, New Haven & Hartford.

Mr. A. S. Douglass, Superintendent of Motive Power and Machinery of the Texas & Pacific, who has been at El Paso some time for his health, is reported to be on the rapid road to recovery.

Mr. John Grace has been appointed General Superintendent of the Monterey & Mexican Gulf, taking effect Oct. 28, with headquarters at Monterey, Mex., in place of Mr. C. A. Merriam, resigned.

Mr. Theodore D. Kline has resigned as General Manager of the Mexican National Railway. He was formerly Superintendent of the southwestern division of the Central Railroad of Georgia.

Mr. E. S. Bowen, formerly General Manager of the Rome, Watertown & Ogdensburg, has been appointed General Manager of the New York & New England, to succeed Mr. C. S. Mellen.

Mr. H. R. Hodges has been appointed Superintendent of Tests in the Department of the General Superintendent of Motive Power of the Baltimore & Ohio Railroad, vice Mr. L S. Randolph, resigned.

Mr. George James has been appointed Master Mechanic of the western division of the New York, Chicago & St. Louis, with headquarters at Stony Island, Ill., to succeed Mr. T. B. Hindel, resigned.

Mr. M. M. Reid has been appointed Master Mechanic and Master Car Builder of the Savannah, Americus & Montgomery Railway, to succeed Mr. William Argue. Mr. Reid's headquarters are at Americus, Ga.

Mr. C. A. Merriam has resigned as General Superintendent of the Monterey & Mexican Gulf to become General Manager of the Mexican National, with headquarters at the City of Mexico, succeeding Mr. T. D. Kline, resigned.

Mr. D. Mackenzie, General Purchasing Agent of the Central Vermont, has been appointed Superintendent of the New London division of that road, with headquarters at New London, Conn., in place of Mr. C. F. Spalding, resigned.

Mr. E. E. Davis, Master Mechanic of the Boston & Maine shops at Boston, Mass., has accepted the position of Superintendent of the new Boies Wheel Works at Scranton, Pa. Mr. Davis is well known as one of the most able of railroad shop managers.

Mr. C. F. Rydberg, formerly Superintendent of the Pullman car shops, has resigned to accept the position of Superintendent of the St. Charles Car Works. The St. Charles management are to be congratulated upon securing Mr. Rydberg's services.

Mr. T. B. Purves, Jr., has been appointed Master Mechanic of the Boston & Albany shops, at East Albany, N. Y., in place of his father, Mr. T. B. Purves, Sr., who has held the position for 40 years, and who will hereafter act as assistant to his son.

Mr. W. H. Johnson has been appinted General Foreman of the Southern California shops at San Bernardino, Cal. Mr. Johnson is a New England man, and before going to the Pacific coast worked on the Boston & Albany and on the Old Colony railroads.

Mr. T. B. Hindel has resigned as Master Mechanic of the western division of the New York, Chicago & St. Louis at Stony Island, Ill., and has become interested in a patent car wheel with Mr. L.C. Leach, formerly Master Car Builder of the New York, Chicago & St. Louis.

Mr. George F. Brown, Jr., has been elected President of the Wickes Refrigerator Company, in place of Mr. James H. Wickes, deceased. Mr. Walter H. Wickes has been elected Secretary and Treasurer of the company, in place of Mr. George F. Brown, Jr.

The office of Master Car Builder of the South Carolina Railway has been abolished. Mr. C. M. Roberts, Superintendent of Motive Power and Machinery, has been given full charge of the car department. Mr. W. F. Strong has been appointed General Foreman of car shops located at Charleston.

Mr. George E. Sampson, Road Foreman of Engines of the Chesapeake & Ohio, having been assigned to other duties, Mr. J. R. Belton has been appointed Road Foreman of Engines, Cincinnati, Lexington and Big Sandy divisions, The jurisdiction of R. W. Harris, Road Foreman of Engines, has been extended over the Huntington division.

Mr. J. B. Copeland has been appointed Superintendent of the Seattle & Montana and Fairhaven & Southern and New Westminster Southern roads, the coast lines of the Great Northern system, with headquarters at Seattle, Mont., to succeed Mr. A. L. Homer, resigned. Mr. Copeland has heretofore been a conductor on the eastern end of the Great Northern system.

Mr. J. M. Allen, for 25 years the President of the Hartford Steam Boiler Inspection and Insurance Company, was recently the recipient of a handsome testimonial from his associates and the officers of the company, on the completion of the quarter of a century in his office. It consisted of a very rich service of 101 pieces of silver, together with an album of autograph tributes of friendship and esteem.

Mr. James G. Hubbard, who has been for many years connected with the Erie system, has been appointed Master Mechanic at East Buffalo in place of George B. Ross, who recently resigned. Mr. Hubbard was for many years Assistant Master Mechanic of the Erie, and on the opening of the Buffalo & Jamestown, now the Buffalo & Southwestern, division of the Erie, he was made Master Mechanic of that line. On the consolidation he was made foreman of the car repair shop at East Buffalo, which position he has since held.

Lieut. Frederick Schwatka, U. S. A., the Arctic explorer, died at Portland, Ore., Nov. 2. He was born at Galena, Ill., in 1849, and graduated from West Point in 1871. He served in the 3d U. S. Cavalry from that year until 1884, when he resigned to enter civil life. From June, 1878, until September, 1880, he was in command of the Franklin search party in the "Arctic," which accomplished the longest sledge journey ever made. 3,521 miles in length, and occupying 11 months 20 days. It experienced the coldest temperature ever recorded. Jan. 3, 1880, a day on which the party moved camp 12 miles, the thermometer showed 71 degrees F. below zero. This was also the first expedition to travel through the whole of an Arctic winter. It buried a large number of Sir John Franklin's dead, and brought back the remains of one officer of that ill-fated expedition.

Mr. Schwatka made two other trips to Alaska, one for the government and one for the New York *Times*. He was a record breaker in several ways. During his first trip to Alaska his party built a raft, and floated down the Yukon River 1,305 miles, the longest recorded raft journey in the world. During his second trip to Alaska Mt. St. Elias was ascended for over 7,000 feet, the highest ascent ever made above the snow level which here reaches to its base.

Mr. Jacob Johann has been appointed Superintendent of Machinery of the Chicago & Alton Railroad, to succeed Mr. A. W. Quackenbush. Few railroad men are more widely or favorably known than Mr. Johann is in consequence of his long and honorable career as a railroad mechanical officer. Under different titles he has been the head of the mechanical departments of the Missouri Pacific, the Wabash, and the Chicago & Atlantic and Texas Pacific roads. The "Johann" engines on the Wabash remain at the present time examples of durability of construction and efficiency of service. It was one of these engines, No. 151, that accomplished the fastest run ever made on the Wabash, April 3 last, and described in the May issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER. On this occasion 12 miles from Forest to Sibley, up hill, were run in 11 minutes, 65 miles per hour; and 21 miles, from Bement to Decatur, slightly ascending grade, were run in 17 minutes, 74.12 miles per hour, by engine No. 151. For several years Mr. Johann has had charge of the Chicago office of the Safety Car Heating and Lighting Company, devoting especial attention to the Pintsch lighting system, controlled by that company. He assumed his new duties Nov. 15.

Fuel Consumption on Russian Railroads.

Statistics have been published of the consumption of fuel on Russian railroads for the seven years ending with 1890.

The following shows the decrease in the consumption of wood:

YEARS.	
1881	1,482,040 cords.
1883	1,653,560 "
1890	1,455,240 "

The railroad mileage increased during this time 29 per cent. Anthracite is used much less than formerly, 177,858 tons in 1881 and 92,178 in 1890; but there is a large increase in the use of the bituminous coal which comes from the Donetz, like the anthracite, and in that from the Ural and Polish mines, and a great decrease in all the imported coal and in that from the Moscow mines, which latter affords only half as much heat per ton as good English coal. The most remarkable increase has been in naphtha, of which 2,088 tons were used by locomotives in 1881, and 317,790 in 1890. Naphtha is reported as equal in heating power to 1.39 times its weight of English coal, which is itself just about equal to Russian anthracite and better than Russian bituminous coal. The naphtha is used chiefly on railroads leading to the Caspian Sea. One of the fuels used is peat, of which 56,376 tons were consumed in 1890.

The greatest celebration ever given in Southern Mexico occurred at Oaxaca, Nov. 12. It was the official inauguration of the Mexican Southern Railway, which is considered one of the most important commercial enterprises ever undertaken in Mexico. It extends from Pueblo to Oaxaca, and forms a link in the proposed Pan-American railway.

The lease which the New York, New Haven & Hartford had with the Wagner Palace Car Company has expired and the former will hereafter run its own drawing room and buffet cars. A new train has been put on which leaves New York at two o'clock P. M. daily, carrying one buffet and three drawing room cars, which were built especially for this service and are finished in both light and dark woods, with green plush upholstery, and contain the most recent improvements in steam heating and illumination.

A paper recently read before the Society of German Engineers states that while formerly Russia drew its supply of engines from Germany, England, Belgium and France, it is now independent of outside establishments and turns out its own locomotives. Sweden and Norway also have abandoned foreign markets and meet their demands in this line with native products. Italy has a number of small locomotive works, but is still dependent, to some extent, upon German, Austrian and French builders. Spain and and Portugal secure the larger number of their engines from France, though patronizing also, in a small way, German and English works.

The Homestead strike was declared off Nov. 21. Nov. 18 the strike at the Beaver Falls mills was declared off by the three lodges of the Amalgamated Association. The men left the lodge room in a body and marched to the mill. Man after man made application for work, and in less than an hour 100 were enrolled. The same day a thousand striking laborers made application for work at the Homestead mills. About 300 were given employment, and the others will be placed as the company needs them. The company has issued instructions to the heads of departments to employ no man who will not sign an agreement pledging himself to resign from all labor organizations and to submit to the rules and regulations of the company. Blanks have been printed containing the conditions upon which a striker can re-enter the company's employ.

Communications.

Action of Brakes on Both Sides of Wheels.

Editor National Car and Locomotive Builder:

Referring to the question from "Inquirer" in the NATIONAL CAR AND LOCOMOTIVE BUILDER for October, concerning the action of brakes on both sides of all wheels in four-wheel trucks under passenger cars, will say I have had no experience with air brakes supplied to both sides of the wheels. I do not remember to have seen an application of this kind.

In my opinion it might prevent the tilting of the trucks; at the same time, I do not think this tilting should take place on a properly designed truck and brake rigging, as the pressure from the brake should be equal on all wheels.

I am under the impression the tilting referred to is caused by the truck bolster having too much lost motion between the truck transom, as the tilting will be greatest on the end of the truck in the direction the car is moving, and will be reversed when the movement of the car is reversed. If the journal bearings and wedges fit the journal boxes properly, there should be no unseating of bearings. The tendency to pull the wheels inward by the brakes is not so great as it looks: the tendency is rather to pull the truck frame down in a vertical line from center of axle. This movement is taken up by equalizing springs.

B.

Copies of M. C. B. Association Reports Wanted.

Editor National Car and Locomotive Builder:

I wish to secure the seventh (1873) and the 10th (1876 annual reports of the conventions of the Master Car Builders Association, which I need to complete my files. It has occurred to me that some of the readers of your paper could perhaps supply the want. I am willing to pay a reasonable price for them.

GEO. H. NETTLETON,
President and General Manager K. C., Ft. Scott & Memphis R. R.
Kansas, City, Mo.

The Arbitration Committee's Expenses.

Editor National Car and Locomotive Builder:

The M. C. B. Association, at its last session, seems to have settled the status of the "Grievance Committee" as the court of last resort for the government of the rules for interchange traffic by voting to assume its expenses when in session for hearing appeals from the rules, and as to a railroad company's liabilities under the rules. But was not this a crude, and what will prove to be an unsatisfactory, disposal of this question? Why should not the costs be charged to the parties who appeal to the good offices of the committee? Is it fair to a railroad company that avoids appealing to the committee, and may not trouble them for a year or two, to be taxed for its expenses? Suppose a railroad company that obtains competent and experienced men and exercises care in organizing its inspectors and instilling into their minds the fact that the M. C. B. rules are to help traffic along and not to hinder it, and thus are saved from the annoyance of calllng a third party to transact their business for them, should such a road be taxed for the expenses of this committee?

A careful scrutiny of the appeal cases shows that a large per cent. of the cases arose through the ignorance of the car inspectors as to the meaning of the rules, or an honest difference of opinion as to their meaning. This would indicate that the calling together of the men of a system who have the practical operation of the rules in their hands might be of mutual benefit to them and their employers.

It may be claimed that all the roads have the benefit of the deliberations and decisions of this committee, and this is true in a measure, and it may be fair that the association should assume a percentage of the expenses, but who should pay the remainder? DOPE BUCKET.

The Link and Pin Coupler vs. M. C. B. Type.

Editor National Car and Locomotive Builder:

I have read with interest several articles in favor of automatic link couplers by one who signs himself "A Switchman," in *The Railroad Car Journal*, and must acknowledge that he makes some very hard hits in regard to the conduct of M. C. B. couplers compared with the link couplers, in reference to side motion and the derailment of cars. Unquestionably the M. C. B. couplers, as a rule, have been badly treated and neglected in the essential features to which they should be adapted, and conditions under which they should operate in order to avoid general condemnation by trainmen having them to deal with. The majority of M. C. B. car couplings are constructed to contours compelling the nose of the jaw to hug the inner wall of the adjacent coupler, and vice versa, which in the lateral motion of the couplings reduces or rather confines the bars to a movement of one-half inch per coupler and one inch as the total for the two when coupled together. In the link type the pin constitutes the pivotal point from which the link operates. In this manner a standard link attains, on an average, a lateral motion of two inches. If the bar stems be allowed one-fourth at each side we then have 2½ inches as a total clearance to prevent the cramping of the wheel flange which otherwise might cause derailment when rounding curves. Now let us see what can be done for the M. C. B. type in reference to the necessary lateral motion which has always existed with the link couplings. First, we give the result of the M. C. B. coupler as generally used with a lateral play of one inch and will now proceed to the facts as they should exist when correct contour lines are used and the couplers properly applied to cars.

In the use and application of M. C. B. couplers it is necessary to construct them to contour lines that will give them a clearance of three-sixteenths inch between the nose of the jaw and the adjacent coupler, so that the bars will not hug each other. By this means we have attained three-eighths inch to be added to the one inch previously described, which now gives us 1⅜ inchs to 2½ inches in the link coupler. Now let us see what we are going to do about this thing with a crank in the case for an emergency stop, the cushioned carrier iron having a lateral motion of 1½ inches added to 1⅜ inches, making 2⅞ inches in favor of the M. C. B. type against 2½ inches for the link coupler, including a thorough protection to the couplers under all conditions of service.

Having shown clearly how to overcome the argument of the switchmen and brakemen who have failed to discover the necessary requisites, as they were not visible at the time will now take up the tail end of the subject in relation to starting as heavy trains with M. B. C. couplers as with the link type by means of free slack in the latter. In considering this problem it will be necessary to change the conditions in one to meet the exigencies of the other, in order to place them both on the same level.

First, we have free slack, and, secondly, spring slack, to form the basis of operation. Therefore, to attain the same means to start a train equipped with the M. C. B. type (as that existing in the link type) it will be necessary to reduce the capacity of spring slack from 18,000 pounds per car end to that of about 5,000 to 7,000, and reinforce the latter condition by cushioned mediums of very short travel not to exceed one-half inch. Hence, with the present standard drawbar pocket, it would require a spring seven inches long (instead of eight inches), the spring and cushioned travel being two inches, as in present use. In this manner the spring slack from 5,000 to 7,000 pounds per car end will readily yield to the compression force of the locomotive, and in the forward movement will add the capacity of the springs to moving the train, the total of which would be 400,000 pounds of stored energy in a train of 40 cars equipped with springs of 5,000 pounds capacity per car end, making 10,000 per car.

We will now add the capacity of a 5,000-pound spring to a cushioned basis of an average of 500,000 pounds in a half inch travel to 1½ inches of the spring, giving a total upon a spring and cushioned basis combined of 505,000 pounds per car end against the capacity of the present 18,000-pound spring, which is insufficient to withstand the shocks too great to serve as stored energy in the starting of the train.

The facts and figures herein given are not theory without demonstration, but are based upon test and service. Hence there seems to be nothing left at all for the link and pin, but to cast it away as a lost cause without redemption.

A. W. VAN DORSTON.

WASHINGTON, D. C., Nov. 16, 1892.

"Railway Car Construction."

(*From the Journal of Railway Appliances.*)

The volume of 175 pages is without doubt the most valuable contribution to the literature of car construction that has been published for many a year. In his preface the author says: "In treating the subject it was found impossible to do it justice by illustrating and describing a series of complete cars, and I therefore decided to handle it in detail. No new theories have been advanced and whoever looks for an ideal car in the following pages will be somewhat disappointed." And it is this method of handling the subject which makes the book so especially valuable. The technical papers are filled with descriptions of cars in galore, but if a designer wishes to post himself regarding the details of any one part he is obliged to institute a long search through the records. In this book, however, the principal details are thoroughly illustrated and dimensions given, so that there can be no doubt or hesitation about the construction. . . . Taken all in all, the work has been exceedingly well done, the engraving and printing are of a high order and the book is one that should be in the library of every car builder.

An electric road, 40 miles long, is to be built between Tacoma and Seattle, Wash. It will be used for both passenger and freight business.

The fastest time ever made by a train on the Chicago & Alton Railroad was made Nov. 7. The train was drawn by engine No. 92 and Engineer Foote was at the throttle. The distance from Bloomington to the Union Depot in Chicago, 131 miles, was made in 155 minutes. The run from Bloomington to Joliet via Coal City, a distance of 91 miles, was made in 100 minutes. Two stops were made for orders and two stops for railroad crossings. The run from Pontiac to Odell, 12 miles, was made in 9 minutes, a rate of 75 miles an hour.

A Novel Building.

A novelty in architecture is proposed in Chicago in the shape of a building to be constructed, so far as the exterior is concerned, entirely of aluminum and glass.

The first story will be of ordinary height, and the stories above 12 feet, 10 feet 6 inches and 11 feet in the clear. The windows will occupy the entire distance between the stories save the small amount of space required for the mullions, and each window will have two sheets of plate glass 11 feet long joined at the center with a line of aluminum, making practically one plate of glass 22 feet long.

It will be seen that the dimensions of this glass are equal to that of a very good sized room. On each side of this large plate will be a smaller window, about two or three feet wide, provided for the purpose of ventilation, etc. The mullions between the two windows will be covered with aluminum plate.

Thus, the two fronts of the building, which is to be located at the corner of State and Madison Streets, will present a beautiful surface of aluminum bronze and plate glass. There will be three columns on the State Street front and four on Madison Street, running up the entire height of the building, the metal of these columns being in ornate and pleasing forms, developing at the cornice into interacing palm leaves.

Twelve sleeping cars are being built for the Canadian Pacific by a car buiiding firm at Coburg, Ont.

The Interstate Commerce Commission has taken up for consideration the question of an amendment to the Interstate Commerce Act legalizing legitimate pooling.

The gross earnings of the New York Central & Hudson River Railroad and its leased lines for October were $4,289,877.52, an increase of $116,214.40 over the corresponding month in 1891.

Published particulars of new rolling stock ordered by the French railways for the present half year show the cost of cars in that country. The Eastern Railway has ordered 10 first-class cars, costing $2,190 each, and 85, costing $1,930 each; 100 baggage cars at $593, and 150 freight cars of 22,400 pounds capacity at $728; 100 at $518, and 250 at $385 each. The company has also ordered 1,500 sets of wheels at $14 each.

The New York, Lake Erie & Western is making a great bid for passenger business to Buffalo and the West, and the road was never in better condition to handle it than at present. Many new coaches have been added during the past few months and with them are being operated Pullman sleeping and day coaches. Large engines of the company's standard type are hauling fast trains on all divisions. Interlocking switches and the absolute block signal controls the movement of all trains. Rock ballast, hard wood ties and heavier rails make the roadbed the smoothest and best adapted for speed the Erie has ever had.

Recent investigations of the progress made in increasing the capacity of German freight cars show that only three railroads have completed the change of their box cars from 22,000 to 27,500 pounds, while four companies have ordered 1,092 new box cars of 33,000 pounds capacity. A number of the railroads, including the larger part of the German mileage and equipment, have decided to make 15 tons the standard for the new open cars. Two companies have changed some old 10-ton open cars so as to carry 15 tons, and the Prussian State railroads have, as an experiment, built a number with 30 tons capacity. These latter have four axles and are made somewhat on the American plan, with trucks.

Canadian reports say that President Van Horne of the Canadian Pacific Railway has made an offer to the Dominion Government for the purchase of the Intercolonial Railway and for the establishment, under Canadian Pacific management, of a fast Atlantic steamship line. It is said to be likely that this offer will be accepted at an early date. The Intercolonial Railway is 1,154 miles in length, its main line, from Chaudiere Junction, Quebec, to Halifax, Nova Scotia, being 678 miles long. Administered by the government, the road, with gross earnings of $2,977,395 during 1891, showed a loss from traffic operations of $684,946. The Canadian Pacific's proposal is that the Intercolonial shall be transferred to the Canadian Pacific with the annual subsidy for a term of years amounting to the recent annual deficits, which are in the vicinity of $700,000.

The relations between one of the principal railways in France and its 23,000 employés have been recently published. Not only the employés of the company, but their wives, families and relatives, have privileges upon a carefully graduated scale. The nominal wages are low, but they are supplemented by an elaborate system of bonuses. For example, an engineman gets an allowance for any coal he may save out of the normal censumption of his engine, and if he has to work overtime his coal saving is secured to him by an allowance of so much per minute. There are innumerable details of this sort, involving great minuteness of account-keeping. The system is based upon the principal of rewarding excellence of service, providing advantages for employés, and giving precedence to the claims of their children for employment.

Standard Firebox Arches of the Southern Pacific Railroad.

The accompanying drawings show the standard bricks used for fire-box arches on the Southern Pacific Railroad. The illustraions of the two arches with the information given show the manner of application. All bricks are marked on the lower side. It will be noticed that the point for the center line of studs is given for each class of engine, then the rise per foot is arranged for according to the location of the furnace door, the object being to have the top of arch about level with top of furnace door, but not allowing it to approach the crown sheet closer than 14 inches. This plan gives very good satisfaction. In some cases where it is practicable considerable advantage has resulted from increasing the length of the arch by adding another brick to it. This matter is worthy of more thought than is usually given it.

The purpose of the brick arch is to compel a longer travel of the gases of combustion within the firebox, and before entering the boiler tubes than occurs in plain fireboxes. This longer travel gives more time for the mingling and combination of the gases of the coal and the oxygen of the air while still in the high temperature of the firebox, for beyond it, in the tubes, the temperature of the gases is so quickly lowered below that necessary for ignition that combustion is extinguished.

This being the purpose of the arch it would seem that the farther it extended toward the back of the firebox, giving the longest possible travel to the gases, the more effectively it would accomplish that purpose. The limitations, of course, are the distances that the arch must be kept from the back and crown sheets, which usually should be between 15 and 20 inches.

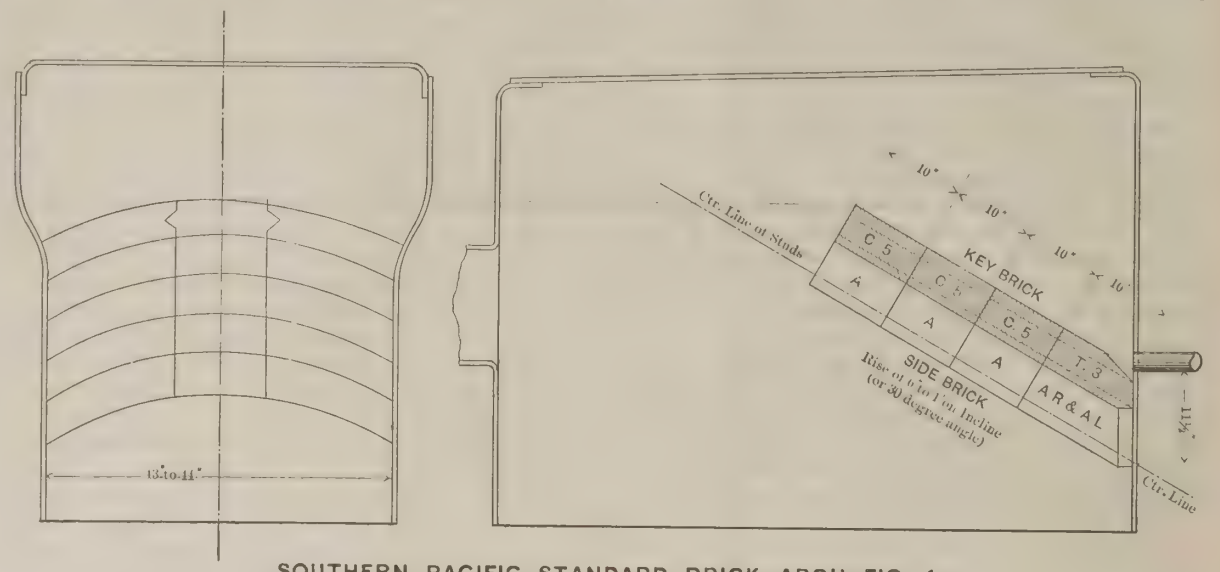
Number and Kind of Brick Used for Arch Shown in Fig. 1.

1 Key brick marked	T. 1	1 Side brick marked	A. R.
2 " "	C. 1	1 " "	A. L.
1 " "	C.	4 " "	A.
1 Side brick marked	B. R.	1 " "	B. L.

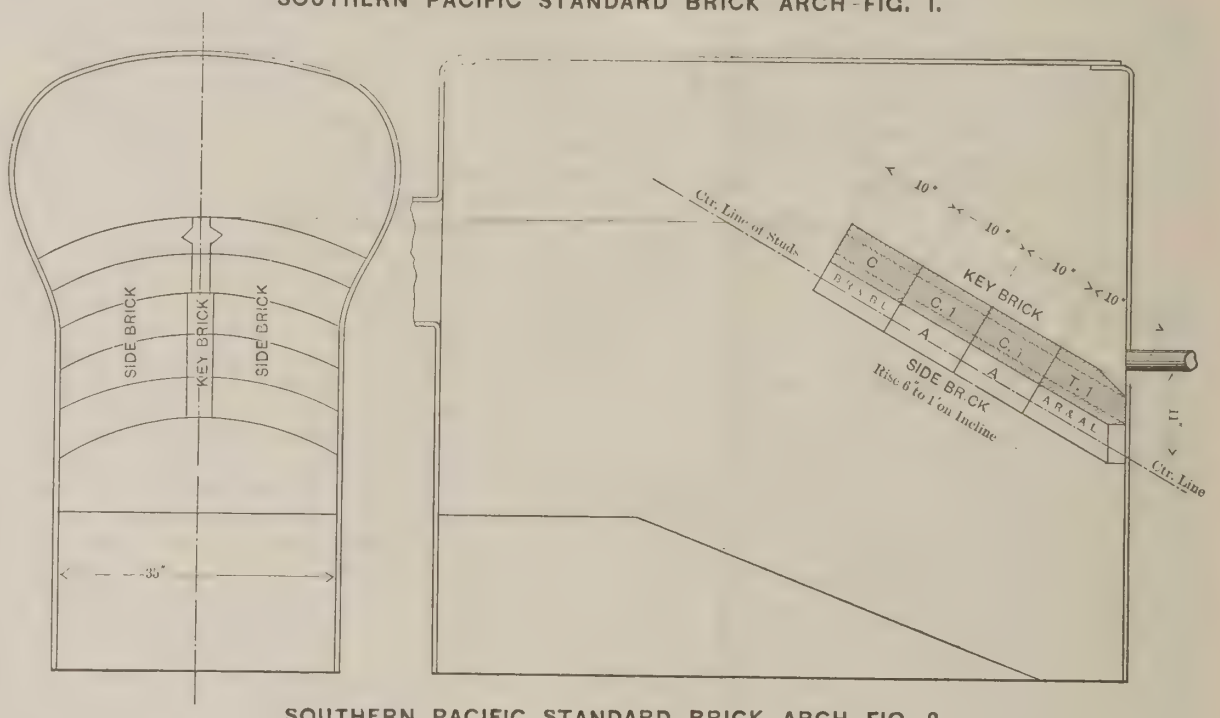
Number and Kind of Brick Used for Arch Shown in Fig. 2.

1 Key brick marked	T. 3	1 Side brick marked	A. R.
2 " "	C. 5	1 " "	A. L.
1 " "	C. 6	6 " "	A.

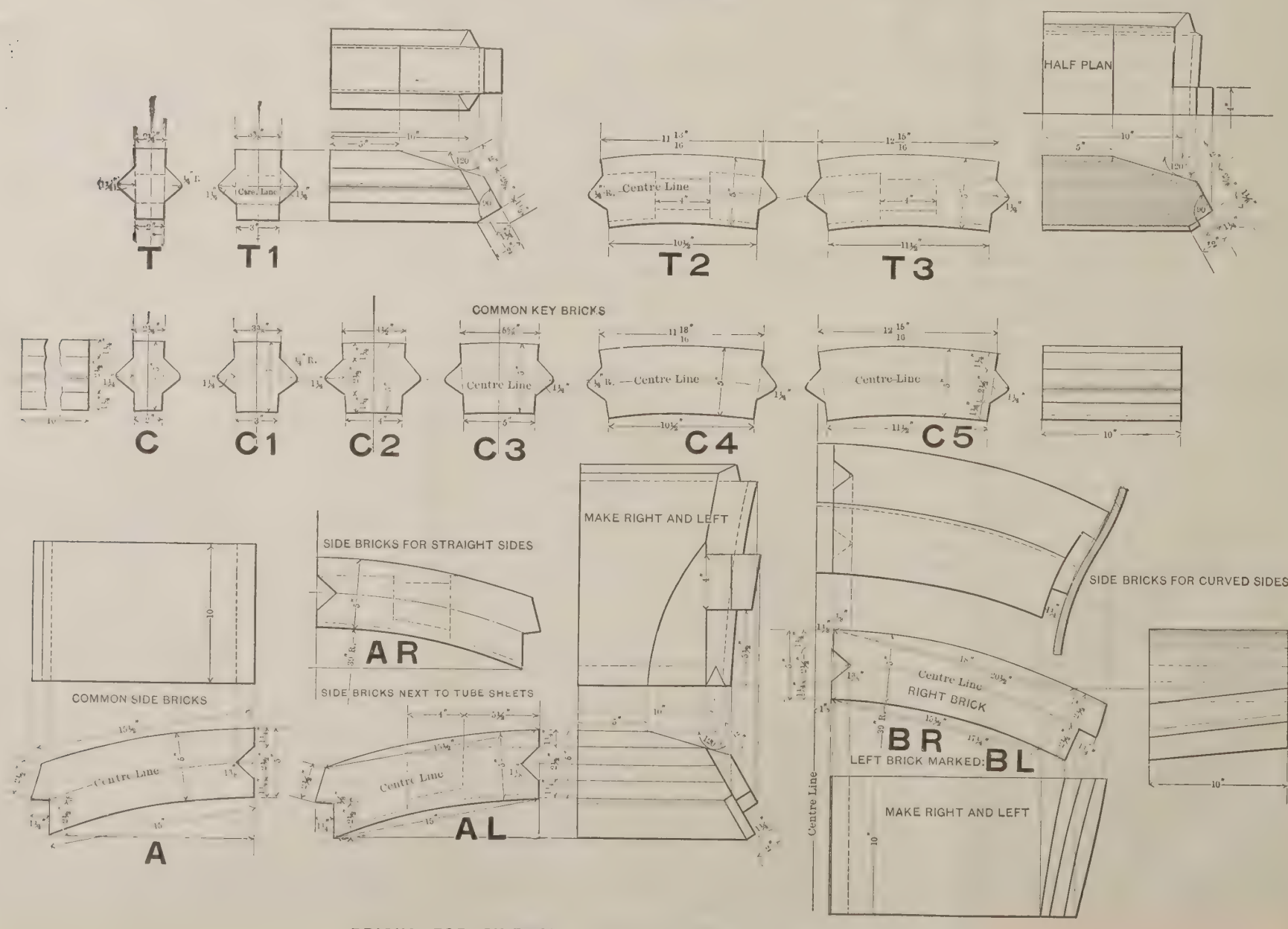
The shops of the Pacific system of this company's lines are situated at Sacramento, and cover an area of 42 acres of which 17 acres are occupied by buildings, employing from 1,800 to 2,000 men continually, with a monthly pay roll of $125,000. These shops are principally devoted to the maintenance and rebuilding of the rolling stock of the 4,500 miles of railroad constituting the Pacific system of the company, consisting of 731 locomotives, 931 passenger cars and 15,712 freight and miscellaneous cars; also the general repair work of the floating equipment of the company, consisting of 26 ferry and river steamers, tugs and barges. The shops are conveniently arranged for the rapid and systematic production of the different classes of work. The machine shop is well equipped, and has a traveling crane capable of lifting the heaviest locomotive. The forge shop has a 30-ton jib crane and numerous steam hammers, and can handle forgings up to 20 tons in weight. The output of axles ranges from 40 to 50 per day. Here are also produced the steel brake beams used on the road, which are forged from old steel rails, and which was illustrated on page 32, NATIONAL CAR AND LOCOMOTIVE BUILDER for February, 1892. The rolling mills have an annual production of 12,000 tons. The wheel foundry has a capacity of 300 wheels per day, and the average daily melt of the cupolas is about 60 tons. In the car shops, constructions, repairs, painting and upholstering for all classes of cars are well provided for. The forests of California, Oregon and Washington furnish the supply of lumber used here. The paint shop has a capacity for handling 21 passenger cars and 8 large



SOUTHERN PACIFIC STANDARD BRICK ARCH—FIG. 1.



SOUTHERN PACIFIC STANDARD BRICK ARCH—FIG. 2.



BRICKS FOR FIREBOX ARCHES, SOUTHERN PACIFIC RAILROAD.

Pullmans. In addition to the general railway repair work, the output of these shops for 1891 was as follows:

Chilled car wheels, 29,854; rolled iron, 12,753,997 pounds; iron castings, 8,154,878 pounds; brass castings, 265,295 pounds; journal bearings, 241,764 pounds; phosphor-bronze castings, 40,746 pounds; Babbitt, 284,374 pounds; track spikes, 2,460,900 pounds; track bolts, 627,596 pounds; nuts, 678,377 pounds; angle plates for track, 3,981,668 pounds. In late years some 63 locomotives, ranging from eight wheeled passenger to 14-wheeled or decapod locomotives were built here.

The building of cars for last year was 547 new freight cars of 30-ton capacity to replace worn-out small capacity cars. Everything used in the construction of this new work was manufactured at the Sacramento shops. The shops also have a well-organized fire brigade composed of 40 employès, with an equipment of five fire pumps and five hose carts; and regular drills are had every two weeks.

Annual Convention of the American Railway Association.

The American Railway Association held its annual convention in New York City during October. President H. S. Haines delivered an interesting address, of which the following is an abstract:

If we recognize the advantage of having a uniform set of rules throughout the country, and if we admit that this standard code conforms in general to the best practice, those who have so far refrained from adopting it may well be asked to waive their objection to this or that rule and their preference for some other not recognized in the code, and to fall in line with the companies operating about 100,000 miles of road that have now substantially accepted it. In what I have said I have sought to establish the necessity for an uniform code of train rules, a necessity which has been provided for in the code adopted by this Association. This code should not be modified in any respect except to conform it to accepted improvements in train service. In this respect the standard code is deficient. It does not recognize improved methods of train service which have been to some extent in use for years on our best roads, and which are now deemed essential to the successful conduct of a heavy traffic. I refer to the means afforded for protection of trains against each other outside of the efforts of the trainmen themselves. From one end of the code to the other there is nothing to show that it is customary in this country to provide any other means for such protection.

The "train rules" so called are, by themselves, applicable only to the operation of a single track road with a light traffic. For any considerable business, even on a single track rrad, they would be supplemented by "The rules governing the movement of trains by telegraphic orders." But when we go on a step further and provide for an increase of traffic by the use of "running sidings" as distinguished from "passing sidings" we get no aid from the code as to the proper rules to be observed in using them. Neither are double track roads recognized except in approaching the end of double track, as in rule No. 94, or in passing from double to single track, as in rule No. 95,

The idea of maintaining intervals of time between trains has been realized in various ways, as by track sentries or by the display of signals at curves or at other specially hazardous points or by a record at stations, visible from passing trains, showing the time that the last train had passed in the same direction. The method of time intervals between following trains affords efficient protection so long as the trains maintain an uniform schedule speed, can be readily stopped within the recognized time interval and are not liable to unexpected delays between signal stations. These conditions prevail on roads doing principally a passenger business with light and frequent trains, and such roads can be and are now successfully operated under this method.

A heavy freight traffic cannot be satisfactorily conducted under a time interval between trains. The liability to unexpected delays between signal stations is great and more time is required to stop the train than in passenger service, as also for flagmen to get back to the distance in which the following train can be stopped, due allowance being made for grades and curves. A proper regard for these different conditions compels an increase in the time interval which seriously embarrasses the service, especially as the intervening passenger trains must respect the same interval, and the resulting tendency is to restrict this interval within too narrow limits.

A comparison of rear collision reports will show that the most of them are with freight trains. Experience therefore proves that a time interval does not afford sufficient protection on roads that have a heavy freight traffic unless that interval be so extended as to seriously interfere with business—yet this was the only method available until it became possible to establish an interval of space by means of the electric telegraph. This method of conveying information has been for some time used for other purposes before it became the accepted medium for orders to trains, but even now that the standard code includes "The rules governing the movement of trains by telegraphic orders," those rules are mainly a protection against butting collisions only. For protection against rear collisions it is not rules for moving trains that are required, but rules for stopping them. We want rules for stopping them by the maintenance of a time interval for those who prefer that method, and rules for stopping them by a space interval for those whose traffic has outgrown that method.

The maintenance of space intervals is no novelty, for it has been for years in use upon many of our roads. The appreciation of its value has become so prevalent that its more general adoption is demanded not only by the railroad journals but also in the daily newspapers. Why, then, does not our train rule committee add to the standard code "Rules for the movement of trains under the block system?"

My conclusion is that their inaction, if I may so term it, is due neither to their inability nor to their indisposition to codify the ordinary practice in the use of the block system, but because they are in doubt as to the sufficiency of that ordinary practice to provide for the normal increase of train service on the roads where these rules are more anxiously desired, and because of the impending changes in the conditions under which the service is to be performed.

To make clear to you what I have in mind I will outline briefly what these conditions have been, keeping in view the object to be attained, the maintenance of a distance interval between following trains. The change of this interval from one of time to one of space was first secured through the aid of the electric telegraph, and the information thus obtained was transmitted by signal from the receiving operator to the engineer of the approaching train. This information was of a simple character, either that there was or was not a train in the space intervening between himself and the receiving operator. This was the fundamental principle of the "block" system, that the engineer of a train approaching a signal station was to be informed from that station whether there was or was not a train in the block ahead of him. The next step was to instruct that engineer as to the use he was to make of that information. There was no doubt as to the rule which he was to follow when the block was clear—he was to proceed. But what was he to do when he was informed that the preceding train was still in the block? Was he to go ahead or not? The safest rule was to stop until the block was cleared. But just as increasing traffic became embarrassed by the time interval, so the same experience followed the institution of the space interval, and this embarrassment it was sought to remove by such a modification of the rule to stop until the block was cleared as permitted the following train to enter the block with the knowledge that it was not clear. This is the broad distinction between the absolute and the permissive block system. The former is not only safe but simple; the latter requires that the rear of the first train in a block must be protected by flagmen with due regard to the relative speed of the two trains, to the curves and gradients of the track and to the distance in which the following train could be stopped. I think, therefore, that it is fair to say that the permissive block system is an improvement on the time interval only in this respect: that the engineer of the approaching train can be informed whether there is or is not a train in the block ahead.

I say that he can be informed, but it is possible that he may not be informed, and, as a matter of fact, sometimes he is misinformed. This brings us to consider the manner in which this information is conveyed from the receiving operator to the approaching engineer. The latter must receive it through the eye or ear by visible or audible signals. If through the eye the impression received must either be as to form, color or position. This opens a field of discussion as to how the visible signals shall be made. If by form, whether a ball, a banner or a semaphore arm; if by color, what colors shall be employed and what they shall respectively signify; if by position of several objects, what shall be their relative positions and what shall they signify.

At this point it may be well to observe that whatever differences of opinion there may be among experts as to the adoption of the absolute or the permissive block system, they ought to make an effort to reconcile their differences so far as to unite in recommending a uniform system of signals for conveying information to the engineer of an approaching train. The causes for their different opinions are all well founded, but they are not irreconcilable. It is true that they have become more involved of late through the introduction of interlocking switch plants, as I will mention later in my remarks; but what I wish to impress upon you is that, in the operation of a block system, a code of rules for the guidance of train men is one thing and a code of signals for conveying information to them is another, and that neither should be confounded with the appliances for operating these sighals. For the better understanding of my views as to the duty of the train rule committee in this matter I will repeat that there are three separate subjects connected with the operation of trains under the block system:

First, the rules for the guidance of trainmen. Second, the signals which are to convey information to them. Third, the appliances for operating the signals..

The applicances for operating the signals are controlled directly by the operator at the entrance of the block, who manipulates them in accordance with the information which he has received from the operator at the outlet of the block. The information that the block is clear or not clear is conveyed to the engineer of the approaching train through human agency, and the possibility of error is doubled, or rather tripled, by the intervention of two persons besides the engineer. He may either misinterpret or disregard the visible signals; the receiving operator may misinterpret or disregard the information which is to control the display of the signals; the sending operator may either transmit that information incorrectly or fail to see it at all.

Leaving out the rules for the guidance of trainmen and the code of signals, the block system, so far as it is in general use, is deficient in providing the means for the protection of following trains, because it does not eliminate the element of human fallibility. This defect railroad managers, signal manufacturers and inventors are trying to remedy, and it is because our train rule committee is conscious of these facts that it has hesitated to indorse the block system as now used. Their hesitation has been increased by the contest between the several systems which have been devised to supplant the present system, and which are now in experimental use to an extent which promises to simplify the solution of the problem by an exclusion of that which has failed in trial. The effort to eliminate human agency begins with the normal state of the signal, whether the action of the operator at that point shall be required to inform the approaching engineer that the block is clear or that it is not. If he can only give this information under the control of the operator at the outlet of the block there is one mind the less to make a mistake. It is for the train rule committee to so determine the normal state of the signal as to reduce the probability of its being misinterpreted or disregarded by the approaching engineer, and for the safety appliance committee to determine the essential requisites of the appliances which shall prevent the receiving operator from displaying a signal improperly.

Going to the other end of the block, we have to guard against the transmission of incorrect information to the receiving operator or the failure to send it at all. The latter contingency may be avoided if the normal state of the entrance signal can be changed only by the act of the sending operator, but the former, the protection against the transmission of incorrect information, is more difficult to secure. This man has to determine that the block is or is not clear, and then control accordingly the display of the signal at the other end of the block. He determines that the block is clear, first from a notification that a train has entered, next by actual observation of its passage, It is not sufficient for him to know that an engine has passed out of the block, but also that every car which was attached to that engine when it entered the block passed out with it. That some such protection should be required by the rules is within the province of the train rule committee, as it is the province of the safety appliance committee, to determine the essential requisites of the appliances by which that protection shall be secured.

Admitting that the operator at the outlet of the block is correctly informed that the block is clear, we have next to insure that this information is correctly transmitted to the entrance and the signal properly displayed. The respective duties of our two committees in this matter are also obvious.

If the rules, signals and appliances for the use of the block system can be successfully wrought out to this stage then there is yet another step to be taken, which shall elminate the intervention of the sending operator. This has been experimentally accomplished by several devices actuated by the train as it passes the entrance and outlet of the block, simultaneously operating a display of the signals required to block the interval which it is entering and to clear that which it is leaving; indeed, this effect can now be extended to the next block behind it, so that the engineer of a following train is thereby informed, not only as to the condition of the block ahead of him, but also as to the condition of the block ahead of that.

This extended protection is required since the speed and momentum of trains have exceeded our ability to stop them within the distance in which, under all circumstances, the signal at the entrance of the block can be made visible to the approaching engineer. To meet this difficulty, and to avoid the consequently necessary retardation of the train, the entrance or home signal has been supplemented by the distant signal, and, in the system above described, the entrance signal of one block is the distant signal of the block next ahead. The circumstances under which distant signals should be required will affect the rules for operating a block system, as well as the essential requisites for the proper appliances.

Here we seem to have reached the ultimate limit of the resources at present available for the protection of trains against each other outside the efforts of the trainmen themselves. There is another step which may yet be taken, that of protecting the trains against the misconduct or neglect of these very trainmen, by the introduction of appliances connected with the block signals which shall strike the engine gong or blow the whistle, or apply the brakes, or even close the throttle valve of the approaching train, but these appliances have not reached such a stage of efficiency as to call for further notice in this connection.

The intervention of mechanical appliances in the movement and control of signals, switches, drawbridges and crossings and the interlocking of such appliances have induced the substitution of other motive power for the muscular power of man, and to-day we employ steam, compressed air and electricity for this purpose, either singly or in combination. To what extent this substitution should affect the standard block system rules or the appliances required by those rules are matters that even our standing committees may not pass judgment upon without the aid of those who are expert in the application of such forces to our purposes.

The Association now includes companies operating 127,000 miles of railway; two roads, the Boston & Maine and the Concord & Montreal, have joined the Association since the last meeting. The Committee on Safety Appliances and the Committee on Train Rules were instructed to work together on standards for use with block signals and interlocking. The following resolution was adopted:

Resolved, That this Association recommends to all its members that all cars used in the transportation of freight requiring high speed should be equipped with power brakes without delay, and also would urge that this matter be brought to the attention af the owners of such cars by the several roads using them.

The next meeting of the Association is to be held at Chicago on April 12, 1893.

Effects of the Action of Time on Steel.

A writer in the *Ironmonger* expresses the opinion that steel is liable to be changed by the action of time, unaided by any external, mechanical, or chemical influence, and, in support of his view that time alone appears to be sufficient to produce these changes, he cites several examples of failures which have occurred within his own experience, some flat steel plates cracking spontaneously, and others on being tested by dropping. Mention is made of numerous boiler plates that cracked after the boilers had been at work for years, and weeks after the steam pressure had been reduced and the water run out, and this, too, in face of the fact of every boiler being tested to double its working pressure when new. Another instance is the cracking of hardened armor-piercing steel shells several months after their delivery to purchasers, this being attributed to the effects of the hardening process—though, if independent of time, the shells ought to crack during the operation or not at all. Such peculiarities are presumed to be caused chiefly by the unequal tension of the metal, whether due to the process of oil hardening or to some other fact. It is well known that some cutlery manufacturers prefer to keep their cast steel ingots two or three years before working them up, their experience demonstrating that the steel is thereby improved.

Cubes of coal with faces five, seven and ten feet respectively will be exhibited at the World's Fair. They were mined at the same place in Logan County, W. Va., and are of different strata in the mountain.

The Danville express on the Chicago & Eastern Illinois road ran into a broken switch at Forty-ninth and Wallace streets, Chicago, Oct. 24, and one of the coaches was thrown from the track. A woman was caught in the wreck and killed and twenty others were injured, one of them fatally.

Take the Biggest.

He was 90 per cent. mouth, and the odds and ends of his face that weren't mouth were freckles.

He got into line at a stamp window in the postoffice, and his wife waited near and kept one eye on him, and both on an imitation leather valise.

"Gimme one postal card," he said, when the window was at length reached.

"What size?" inquired the man inside.

"Hey?"

"What size? I say; there are three kinds."

"Gosh, you don't say. All of 'em cost a cent?"

"Yes."

"Gimme the one that'll go to Delaware County."

"They all will," said the stamp seller impatiently; "three sizes, big, little and medium; which'll you have: shake it up," he added, as the line began to grow restless.

The applicant for one postal hesitated a moment, and then dropped out of the procession, and went over to his wife.

"Looweesa, he says there's three sizes, big, little and mejum."

"Well, which did you buy?"

"Nothin' yet; I thought I'd consult you first, but seein' we're only goin' to say 'we'll git there Wensdy,' I reckon I'll buy the littlest."

"Now, if that ain't just like you, you good for nothin' man," she snapped contemptuously; "you've 'took the littlest' all yer life, and if it hadn't been for me you'd 'er dried up and blowed away years ago. The writin' don't matter, its principle. Try and be a man, even if you ain't; you poor little cuss. Get on to that line, and when he says 'wottle you have,' you plank down yer cent and say, 'gimme the biggest.' Here me?"

"Looweesa's" advice could be followed with profit by many men of greater pretensions than her unsophisticated spouse.

Engines on a Battle Ship.

The following table has been published showing the number of engines on the U. S. Man of War "Oregon."

Number of engine cylinders.	Purpose of engines.	Character of engines.	Diameter of cylinders in inches.	Stroke in inches.
6	Main driving, 9,000 horse-power...	Triple	34½ 48 75	42
4	For air pumps.....	Double	6	12
4	For circulating pumps.....	Compound	7 12	6
2	Hot well pump engines.....	Single	8	16
2	Fire and bilge pump engines.....	Single	10	16
2	Air and circulating pumps.....	Single	10	16
4	Ventilating fans.....	Compound	5 9	6
4	Barring engines	Double	6	6
2	Reversing engines.....	Single	14	18
4	Hydraulic steering gears.....	Double	8	12
4	Main feed pumps.....	Single	12	16
4	Auxiliary feed pumps.....	Single	10	16
8	Ash hoisting.....	Single	5	6
16	Fireroom fans.....	Compound	9	6
4	Steam cranes.....	Double	8	10
2	Hydraulic pumping.....	Single	20	30
8	Steam winches.....	Double	8	10
2	Windlass engines.....	Double	16	12
8	Dynamo engines.....	Compound	7 12	6
2	Ice machines.....	Double	12	16
8	Ventilation	Compound	5 9	6
1	Distilling room air.....	Single	10	12
1	Water and brine.....	Single	6	10

Besides this list, making 112 engines, counting each steam cylinder, there are some connected with the torpedo service, which are not mentioned.

The Chicago & Northwestern was a heavy loser by the great fire at Milwaukee early in November, which destroyed its lower freight houses and 198 cars with a large amount of merchandise. One estimate places the loss at $500,000.

According to *Electrical Industries* 84 new electric railways have been built in the United States during the last year. The new roads and the extensions of old ones aggregate 1,530 miles. The number of electrical roads is now 469, with a total mileage of 5,446 miles and an aggregate capital of $250,870,000.

The Santa Fe passenger officials have received a $3,000 painting from Thomas Moran, the well-known scenic artist. It is a sunset scene in the grand canyon on the Colorado River in Arizona. The perspective includes a territory eighty miles long and fifty miles wide, while the depth of the canyon at several points represented is 6,500 feet.

A company has been incorporated in Maryland as the Washington & Baltimore Boulevard and Electric Railroad Company. The incorporative act requires that work on the road shall begin within six months, and be completed within twenty-four months after the passage of the act. The fare from Baltimore to Washington will be 25 cents.

There are some points in Kansas where it has been impossible to get a car for the past six or seven weeks. The grain that the farmers wish to market is kept on their hands and for all purposes there might as well be no road near them. The roads in accepting the business look after competing points first, and the shippers at junction points have felt the car famine but little.

"A Mystery.—Paw, how wide is the Mississippi River?"

"In some places, my son, it is now ten or twenty miles' wide."

"And how wide is a railroad track, paw?"

"Four or five feet. Why do you ask?"

"Cause the fellers that made this X, Y and Z railroad map have got it just the other way."

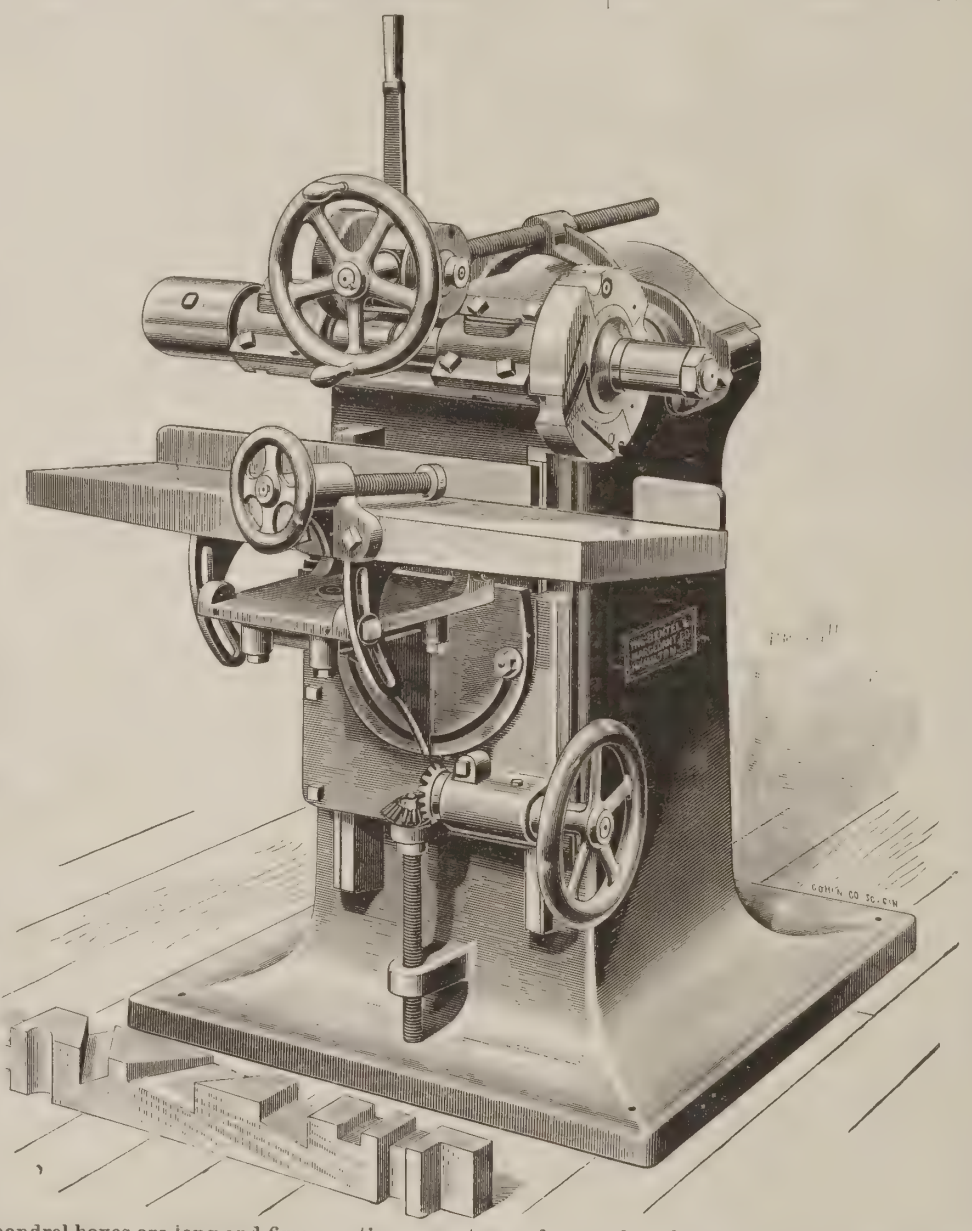
Automatic Traversing Gaining Machine.

The machine illustrated herewith is adapted for all the various requirements of cross-gaining, square, angular, and double angular. The sample piece of material shown at the base of the machine exhibits gains of various widths, depths and angles, all of which, with many others, this machine is capable of producing.

The table can be raised and lowered, and can be turned on a horizontal level, parallel with or in angular line to the line of the cutter mandrel. It can be tilted in either direction from end to end, or in either direction from front to back; in fact, is universally adjustable to any position, for any required straight or angular gaining.

A point of superiority in this machine is its arrangement for feeding the cutterhead and carriage across the table, either by hand or by power feed. The traversing motion across the table is produced and regulated by pressing the lever shown at the top, either to the right or the left, when the cutterhead moves across the tablet with long or short stroke, as may be desired, or the same motion may be imparted by operating the hand wheel shown in front of the cutterhead mandrel.

The machine is very strong in construction, with all parts accurately fitted, all parts apt to wear being provided with gibs to take up wear, and keep the machine at all times reliable and accurate. The frame of the machine is a heavy column, cast solid with heavy well-spread base. The table and table slides are long with broad dovetailed slides. The



mandrel boxes are long and firm, resting on a strong dovetailed housing. The device for the power feed consists of leather and iron friction wheels, and the mandrel of the machine is made of the best tool steel, and is 1½ inches in diameter.

The manufacturers furnish with each machine an adjustable gaining head. This head consists of two separate halves adjusting to cut all sizes by sixteenths up to twice its narrowest width, or width when closed.

The machine is made by the Bentel & Margedant Company, of Hamilton, O.

The B. F. Sturtevant Company, Boston, Mass., have printed a second edition of 10,000 copies of their 200-page General Catalogue, No. 61, which describes the use of their blowers, exhausters, engines, forges and heating and ventilating apparatus, and they desire to place a copy in the office of every superintendent, purchasing agent, engineer, or manufacturer using such machinery. It will be mailed free of charge to those applying for it.

Messrs. Goodell & Waters, of Philadelphia, manufacturers of wood working machinery, have sent us a copy of their catalogue which contains 134 pages of matter descriptive and illustrative of the machines of their manufacture. In our last issue we illustrated a rapid feed flooring machine made by this company. In the catalogue mentioned many wood working machines with new and interesting improvements are illustrated. Notably among these is the endless-bed double surfacer, with joining attachment and center guides. By this arrrangement, two boards or planks can be planed on two sides, and one edge of each jointed at one operation. The catalogue will be sent free to those desiring it.

A large order for hydraulic projectile drawing presses has been awarded to Messrs. Watson & Stillman, of New York, by the United States Projectile Company of Brooklyn. Orders for hydraulic presses, pumps and accumulators have been so abundant during the past year, that it has been found necessary to operate their plant both day and night, notwithstanding increased facilities in the several departments.

The Pennsylvania Railroad Company has been in negotiation with Mr. Merle Middleton, Vice-President of the Railroad Lighting and Manufacturing Company, the result of which has been that they have determined to light the passenger coaches of the lines east and west of Pittsburgh with the "Carburetor" system of car lighting, and have forwarded to the Railroad Lighting and Manufacturing Company a requisition covering 400 cars, which followed one in hand for 100 cars, making, within the past 30 days, a total of 500 cars ordered from the Carburetor company. There are at least 2,000 more of their cars to be equipped together with the 400 Pullmans in service on the P. R. R. lines. The equipment for these will follow, and the Pennsylvania Company expects within a short time to have its entire system equipped with the Carburetor light.

Facts Are Stubborn Things.

The above is the caption of a little seven-page pamphlet issued by the Cleveland Twist Drill Company, of Cleveland, O., briefly outlining the history of that progressive and prosperous firm. We make the following abstract from it:

In June, 1874, in Dunkirk, N. Y., two young mechanics, one a tool maker in the shops of the Brooks Locomotive Works—the other experienced in marine, stationary engine and rolling mill work, commenced the manufacture of twist drills and reamers. They were Americans, and believing that Americans could make as good steel as any in the world, they adopted a brand of American steel for their tools and have used the same brand ever since. They had one lathe, one milling machine, and hired one man. In September, 1876, they moved to Cleveland, O., rented the lower floor of a new building, No. 23 Columbus street, built several milling machines, bought new tools, hired more men and *hustled* themselves. Their business grew rapidly, and they soon filled their shop with machinery and men. In June, 1879, they moved into a three story brick building, built for them, Nos. 24 and 26 West street, occupying the whole building. Having more room they systematized their work and studied how to make the best goods at the lowest possible cost. As they reduced the cost of manufacturing, they reduced the price of their tools. By fair and liberal dealings they made friends of their customers. Their business grew so fast that in 1888 they were forced to look for more commodious quarters and rented a new brick block three stories high, 100 × 45 feet, built expressly for them, and designed to accommodate their special line of work. As their business increased, and they manufactured in larger and larger quantities, they invented and introduced many labor saving devices and machines, which still further reduced the cost of their tools.

Believing firmly in the old proverb that "you had better go slow and learn to peddle," they had not up to this time invested any money in land and buildings, but in 1890, as they needed more room, they bought the lot 100 × 333 feet, on which their building stood, and in the spring of 1891 built an addition three stories high, 45 feet wde by 150 feet long, more than doubling their floor space.

We have received some advance sheets of *Modern Mechanism*, published by D. Appleton & Co., and which is to be a supplementary volume to *Appleton's Cyclopædia of Applied Mechanics*. We notice that a portion of this volume is devoted to the subject of car heating, and that in this department the commingler and direct steam systems of the Consolidated Car Heating Company are described and illustrated.

The offices of the Congdon Brake Shoe Company have been removed from the Monadnock Building to its works at Fifty-ninth and Wallace streets, Chicago. This company's new steel plant is fully equipped for the manufacture of open hearth and crucible steel castings of the best quality and of any weight up to 20,000 pounds. Its iron foundry, pattern shop and machine shop have been enlarged. With the facilities afforded by a completely equipped plant directly connected with all Chicago railroads, it is believed that the output of brake shoes and of steel castings will meet the requirements of the trade, both as to quality and delivery.

By a recently patented English invention it is claimed that the greater part of the tin can be recovered from tinplate scrap in the form of oxide, while the iron is converted into merchantable iron or steel.

The New Hinckley Automatic Brake Slack Adjuster

We illustrate herewith a modified form of the automatic brake slack adjuster, manufactured by the Hinckley Brake Company, of Trenton, N. J.

The new adjuster is designed for use in the lower brake rods at trucks, some roads preferring to adjust at this point rather than in the fulcrum rod at centre of car, as is now done upon the roads using the Hinckley adjusters. Both patterns of adjusters however accomplish the same result, namely, the automatic compensation for the wear of shoes,

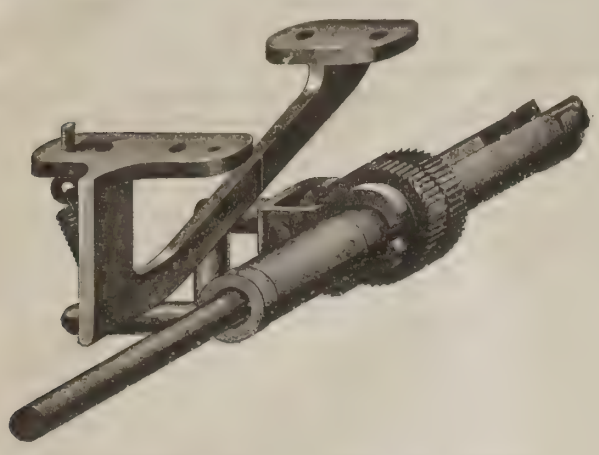


Fig. 1.—General View of Fulcrum Rod Adjuster.

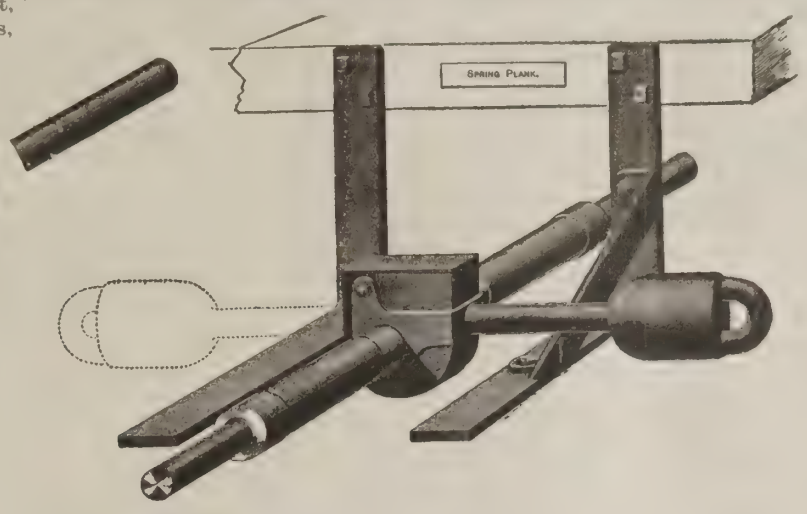
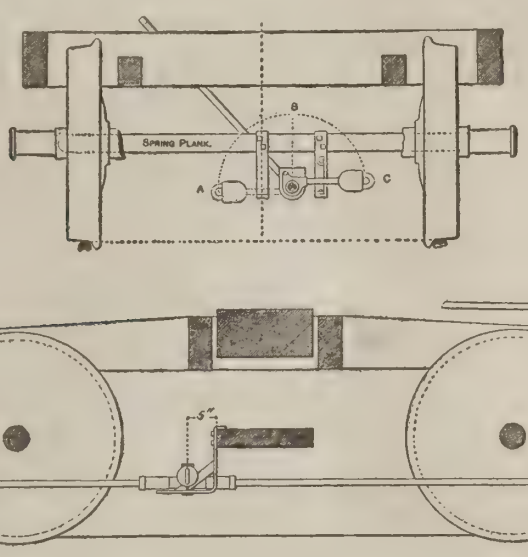


Fig. 2.—View of Adjuster Attached to Lower Brake Rods at Truck.

thus keeping piston travel constant, at any prescribed stroke. The resulting improvement in the effective power of brakes when this is done, is so well known that it is not necessary to refer to it here.

In the illustrations. Fig. 1 is a general view of the Fulcrum rod adjuster, for some time past in use on various roads. Fig. 2 shows the new pattern of adjuster for lower brake rods. Figs. 3 and 4 are end and side elevations respectively at truck, showing method of attaching lower brake rod adjusters to car.

The new adjuster operates upon exactly the same principle as the Fulcrum Rod Adjuster (Fig. 1), but the actuating spring of the latter is dispensed with, and a small counter-



Figs. 3 and 4.—Side and End Elevation of Truck.

weight substituted, which effects the turning of the swivel, and automatic shortening of the lower brake rods whenever the live lever (and consequently the piston of brake cylinder) exceeds the prescribed stroke. The swivel itself with its reversely set ratchets and pawl, are practically the same as heretofore used (see Fig. 1), but all springs are dispensed with. Instead of the operating lever traveling down the inclined bracket, the new lever travels up the incline, as shown in Figs. 3 and 4, but the shortening of the rod occurs as before, upon the release of brakes, when there is a minimum strain on the rod.

All working parts of the adjuster are completely inclosed in dust proof case, the threaded ends of rods being protected as before, by tubes and dust guards. It will thus be seen that the adjuster, cannot be affected by dust, dirt, ice or snow. The protecting box in which are the ratchets and pawl (see Fig. 2) is formed in one piece with the operating lever (see Fig. 1). A dust proof cover is secured over the top.

The operating device as will be seen, is very simple (Figs. 3 and 4). Two bent irons accompanying the adjusters, are secured by lags or bolts to the edge of spring plank, 5 inches from lower rod, one on each side. The iron on one side (as at C., Fig. 3) has a short inclined piece, or angle, riveted to it, forming an incline upon which the operating lever rides. Upon the application of the brakes, the lever moves with the brake rod, and is carried up the slope, raising the pawl within the box upward toward the point of another tooth on the take-up ratchet. If this forward movement of the brake rod is sufficient, the pawl drops into the next tooth above, and upon release of brakes, when there is but a slight degree of tension in the brake rod, the counter-weighted lever drops back down the incline, turning the swivel as it does so, and shortening the rod. This is repeated upon subsequent applications, until slack is so adjusted that the lever does not move far enough up the slope to allow the pawl to again engage a new tooth; nor will it again do so, until the wear of shoes gives an increased movement of brake rod, when the operation is repeated, and the wear corrected as it occurs.

When new shoes are to be put in, the adjuster is slacked off by hand from a point outside the line of rails. In the same way it may be tightened up, if, when new shoes are in, it is found that too much slack has been left; although in the latter event the adjuster will automatically correct this, if left to itself.

The adjuster is purely automatic in its action of reversing the movement of swivel when slacking off, or when taking up slack by hand. To slack off, the inspector simply works the lever a few times between the vertical line *B* (see Fig. 3) and the horizontal position as indicated by dotted lines at *A*. To tighten up the rigging the inspector works lever in same manner, but on the other side of the vertical position *B*, as between *B* and *C*. In other words, the movement automatically reverses upon the lever passing the vertical position. This slacking off, or tightening up, is very quickly effected, as four movements between *A* and *B*, or four between *B* and *C*, slacks off, or takes up respectively, one full inch in upper brake rod leading to live lever. The lever is easily reached, by reaching in over the equalizing bar between wheels, from outside the rail.

The attachment of adjusters to cars is readily made, only requiring the cutting out of 36 inches of the lower brake rod near spring plank and welding the ends thus left to the stub ends of rods on the adjuster. The two side irons (see Figs. 3 and 4) are simply secured to edge of spring plank by lag screws or bolts in their proper positions relative to lower rod. The distance of the sloping iron from the center line of brake rod determine the stroke at which piston of brake cylinder is to be maintained, and may be set for any stroke desired.

These adjusters, as also the fulcrum or cylinder rod adjusters, are manufactured by the Hinckley Brake Company of Trenton, N. J.

Improved Three-Spindle Vertical Car Borer.

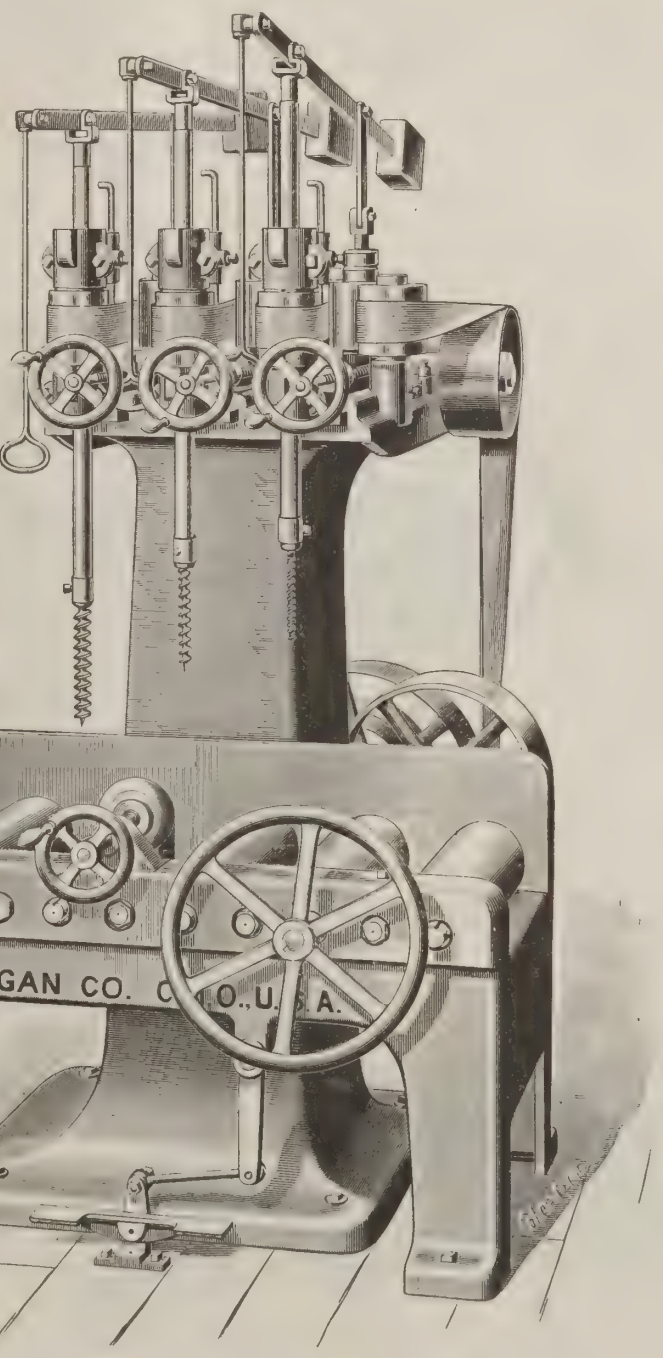
The following cut represents the latest improved vertical boring machine for car and bridge work, being especially designed for the boring of heavy and light timbers with accuracy and dispatch.

The column is cast hollow with ample floor space, and has the roller frame bolted to the front of the same, thereby making a very heavy and reliable machine, capable of standing up to the heaviest work on the largest timbers.

The slides which carry the spindles ha a movement of 15 inches, each independent of the other, operated by a hand wheel and screw and working in planed ways, with gibs to compensate for wear and tear, without changing the tension of the belt. The spindles are made of best cast steel and have a vertical movement of 18 inches. Each spindle is driven at a different speed, to suit the auger and is provided with a stop to gauge the depth of boring. All spindles pass through a sleeve pulley, consequently do not come in contact with the journal boxes. The spindles are also provided with self-oiling boxes at the top.

The roller frame is very heavy and of large surface, and is made to carry six large feed rolls, all driven by friction and operated both ways, being controlled by the foot If it is desired, the rolls can be thrown out of gear, when the foot is released from the treadle, by the means of the large hand wheel. All the movements in this machine are actuated by one single belt. Timbers 15 by 16 can be bored clear through at one operation.

This machine is built by the Egan Company, Cincinnati, O.



IMPROVED THREE-SPINDLE VERTICAL CAR BORER.

The Drexel Railway Supply Company, of Chicago, has issued a descriptive pamphlet of the "Drexel" couples. These couplers are made throughout of the best quality of open hearth steel. They have been submitted to the severest laboratory test standing in tensile strain a pull of 151,000 lbs. without breakage, and drop tests of a 1,640 lb. hammer at all heights, from 5 to 28 feet. Service reports from several roads show a clean record as to breakages, while in all tests by severest bunting of cars, it is claimed, the "Drexel" coupler has never been broken.

The Brown & Sharpe Manufacturing Co., of Providence, R. I., has issued an illustrated pamphlet descriptive of the construction and use of the "Universal" cutter and reameer grinder as made by this company. The pamphlet contains matter of a great deal of interest to mechanics and will be mailed free to any address upon application.

Test of Columbia Universal Coupler.

A remarkably severe test of the above named car coupler, carrier iron and draw gear was made in the latter part of October, at Washington, D. C. The following affidavit describes the test, and the very slight damage resulting. The material used throughout was malleable iron.

This is to certify that on the 26th day of October, 1892, I made a drop test of the Van Dorston cushioned railway appliances, named in the above, and that the test was made on the new post-office site, Washington, D. C., upon a foundation of piling driven 22 feet, which is the limit, and forms a solid foundation. Upon this foundation we made the test, the appliances being arranged in a frame in the same manner as the draw timbers when ready to apply to the car body. The frame was placed on end with the coupler facing the drop hammer, the knuckle nose being provided with a ½-inch by 3-inch strap, so that the drop would have the advantage of crushing or breaking the knuckle by exposing it to the blow upon the fulcrum. The drops were then made as follows, with a hammer weighing 2,000 pounds:

3 blows at 8 feet, no bend or breaks.
2 " " 15 " " " " "
1 " " 40 " " " " "
1 " " 42 " " " " " the knuckle sprung $\frac{3}{4}$ of an inch, and one draw-gear pocket bursted open by compression of the cushion.

The total result of the blows delivered in the six drops without bend or break was 1,128,900 pounds. The sixth blow at 40 feet foots up to 256 tons, but did no injury to any of the parts whatever, leaving the seventh drop of 42 feet to bend the knuckle slightly and to break one draw-gear pocket.

(Signed) S. A. DEXTER.
A. W. VAN DORSTON,
President.

Witnesses:
OLIVER W. ROBINSON,
B. A. ALLEN.

Sworn and subscribed to before me, this 27th day of October, 1892.

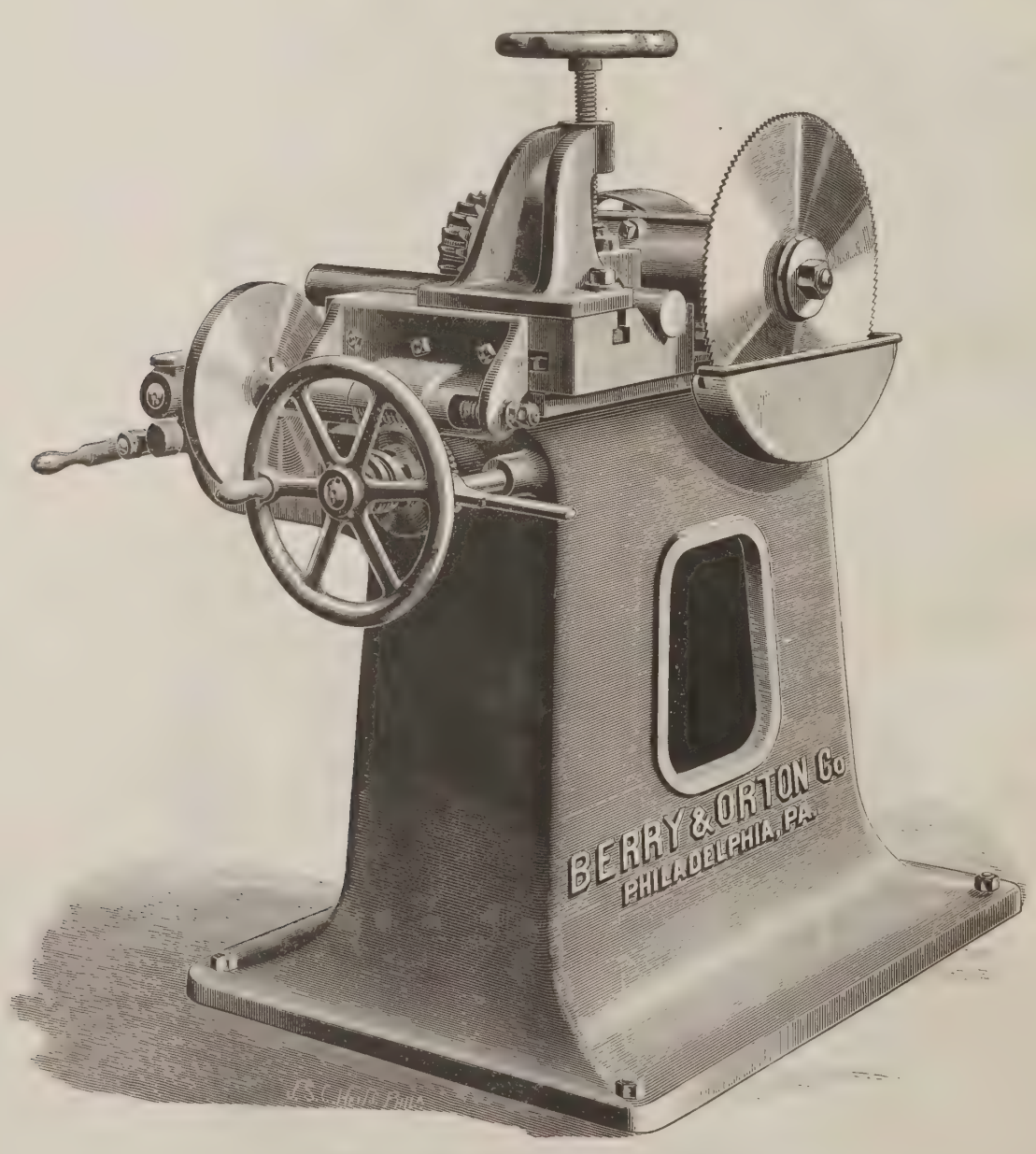
(SEAL) W. CLARENCE DUVALL,
Notary Public.

Cold Cutting-Off Saw.

This machine has been designed with great care to fill a long felt want in every machine shop, *i. e.*, cutting merchant bar metals into suitable and accurate lengths, leaving the surface square and smooth to receive the lathe centers and for other purposes.

The mandrel carrying the saw is made of hammered steel three inches in diameter, mounted in heavy substantial bearings, lined with gun metal and driven by a worm wheel made of phosphor bronze, which in turn is actuated by a hardened steel worm. The feed is variable and automatic, and can be changed instantly from slow to the fastest. This machine is made in three sizes: To cut off 3 inches, 5 inches and 7 inches round. Other and larger machines are made for any desired purpose.

The manufacturer is the Berry & Orton Company, Arch and Twenty-third streets, Philadelphia.



BERRY & ORTON CUTTING-OFF SAW.

The Sturtevant System of Ventilating and Heating.

Many of our readers have heard from time to time of the above named system of heating and ventilating, and those who have not would doubtless be interested if it were brought to their attention. It is a fact that in the larger foundries and shops throughout the country, particularly the new ones, as much attention is being given to the heating and ventilating of them as to any of the other details.

This matter has been neglected in years past and stoves or a few runs of steam pipes have been thought sufficient for the heating. The larger and best concerns are rapidly changing their methods and among their improvements in foundry and shop construction and fitting is the Sturtevant system of heating and ventilating these buildings. The practical and thorough heating of such places is quite a study and when it is done properly is without doubt one of the greatest improvements in their construction.

Among recent large orders of the B. F. Sturtevant Company for the heating and ventilating system are the large new foundries of Frazer & Chalmers, Chicago, Ill.; Illinois Central Railroad, Burnside, Ill.; Brooks Locomotive Works, Dunkirk, N. Y.; Schenectady Locomotive Works, Schenectady, N. Y.; Troy Malleable Iron Works, Troy, N. Y.; Siemens & Halske Electric Company, Chicago, Ill.; Canda Manufacturing Company, Carteret, N. J.; the Lake Erie Engineering Company, Buffalo, N. Y.; Corliss Safe and Vault Door Company, Providence, R. I.; Niles Tool Works, Hamilton, O.; Grant Locomotive Works, Chicago, Ill.

Among the older customers who are using this system for heating and ventilating their foundries are the following: Southwark Foundry and Machine Company, Philadelphia, Pa.; the Link Belt Machine Company, Chicago, Ill.; Morgan Engineering Company, Alliance, O.; Superior Malleable Iron Company, West Superior, Wis.; Case Manufacturing Company, Columbus, O.; Robert Poole, Son & Co., Baltimore, Md.; besides many others.

The B. F. Sturtevant Co.'s Works are located at Jamaica Plain Station, Boston, Mass.

The Erie Car Heating Company, of Erie, Pa., makes the following guarantee of its form of connection of steam pipes between passenger cars which does away with the use of rubber hose:

"We will guarantee our connections against failure or breakage while in legitimate use, for three years from date of shipment, and will contract to furnish free of charge, f. o. b. cars, new connections or parts to replace all such broken ones. This guarantee not to cover breakages from accidents to cars, collisions, or causes outside their legitimate use. All broken connections or parts requiring to be replaced under this guarantee to be returned to us free of charge."

The Damascus Bronze Company, of Pittsburgh, Pa, is very busy filling its orders for Damascus Bronze journal bearings, etc. It contemplates in the near future putting up additional buildings, as it is at present cramped for room.

The Railroad Lighting and Manufacturing Company of Philadelphia, Pa., reports that since the adoption by the Pennsylvania Railroad of its carburetor system of lighting cars, one of the leading railroad companies of the West centering in Chicago has signified its intention of adopting the same system, having already tried and found it satisfactory. Pullman's Palace Car Company is using this system of illumination very extensively.

The Universal Radial Drill Company of Cincinnati, O., have recently furnished the Union Switch and Signal Company of Pittsburgh six of its special drilling machines containing 3, 8, 9, 12, 14, and 30 spindles respectively. This company reports business as excellent, and, finding its shop insufficient for the rapidly increasing business, it is building a larger one with more than double the present capacity.

The United States Car Company announces that it has leased the works of the United States Rolling Stock Company, located at Hegewisch, Ill. (136th Street, Chicago), Urbana, O., Anniston, Ala., and New Decatur, Ala., and is now prepared to build all classes of freight cars for cash, or under the car trust system. It is also prepared to furnish axles of any required test from the forge located at Anniston, Ala. Repairs to freight equipment will receive prompt attention.

A new edition of the Brown & Sharpe Manufacturing Company's catalogue has been received. It contains 248 pages, an increase of 20 pages over last year's edition. This indicates the addition of many new articles of manufacture. Among these we notice new arbors for milling machines, new collets for milling machines, new sizes of milling cutters, new sizes of end mills, special miter gear patterns, bevel gear cutters, 10-inch and 12-inch index centers, standard caliper gages for sizes larger than 3 inch, rubber gage, new special gear patterns, new sizes of gear cutters, concave and convex cutters with formed teeth, and standard angle irons. Catalogues are mailed to any address without charge upon application. The address of the company is Providence, R. I.

Pantasote Leather is an imitation of leather that is not affected by heat, is entirely odorless and water proof. Heretofore it has been impossible to produce a material having the feeling and appearance of leather without using a considerable quantity of rubber in its composition. Under the influence of heat the material became sticky, which objection almost precluded its use for anything but the cheapest furniture. The inventor of pantasote has discovered a suitable substitute for rubber, having none of its unpleasant qualities, while it gives to the goods a surface and texture so much like leather that none but an expert can tell the difference. The railroad car manufacturing companies' trade has been among the first to appreciate the merits of this new material. The practical way in which they have shown their appreciation appears from the fact that the Pantasote Leather Company's mill at Passaic, N. J., is at present working to its utmost capacity filling new and duplicate orders for their goods.

Our Directory.

Boston & Albany.—T. B. Purvis, Jr., has been appointed Master Mechanic of the shops at East Albany, N. Y., to succeed his father.

Boston & Maine.—F. Barr has been appointed Division Superintendent, vice G. W. Hurlbert, resigned.

Brooklyn Elevated.—F. D. Fisher has been appointed Superintendent; E. M. Hedley has been appointed Master Mechanic.

Central Vermont.—D. Mackenzie has been appointed Superintendent of the New London Northern Division, vice C. F. Spaulding, resigned. W. B. Hatch has been appointed Purchasing Agent in place of D. Mackenzie. W. J. Robertson, formerly Superintendent of Motive Power, has been appointed Master Car Builder.

Chicago & Alton.—J. Johann has been appointed Superintendent of Machinery, vice A. W. Quackenbush, resigned.

Cornwall & Lebanon.—A. D. Smith has been appointed General Superintendent.

Fitchburg.—P. Snyder has been appointed Superintendent of the Western division, vice J. Crandell, resigned.

Intercolonial.—F. R. F. Brown has been appointed Mechanical Superintendent, vice H. A. Whitney, superannuated.

Lehigh & Hudson River.—J. H. Olhausen has been appointed General Superintendent.

Monterey & Mexican Gulf.—John Grace has been appointed General Superintendent.

New York, Chicago & St. Louis.—George James has been appointed Master Mechanic of the Western Division, vice T. B. Hinde, resigned, with headquarters at Stony Island, Judd P. O., O.

New York, Lake Erie & Eastern.—James G. Hubbard has been appointed Master Mechanic at East Buffalo in place of George B. Ross, who recently resigned.

New York, Lake Erie & Western.—C. R. Fitch has been appointed General Superintendent, vice J. H. Barrett, resigned.

New York & New England.—C. S. Mellen, General Manager, has resigned, to accept the position of second Vice-President and Traffic Manager of the New York, New Haven & Hartford. E. S. Bowen has been appointed General Manager.

Norfolk & Western.—S. O. Martin has been appointed Superintendent of the Radford division, vice John A. Hardy, deceased.

Oregon Pacific.—A. L. Homer has been appointed General Superintendent, with office at Corvallis, Ore.

South Florida.—H. B. Plant has been elected President, vice J. E. Ingraham, resigned.

Tennessee Midland.—J. P. Meredith, Superintendent, having resigned, W. J. Hills has been appointed Superintendent, with office at Paducah, Ky.

Texas Western.—R. L. Malley has assumed the duties of Superintendent, vice A. Cross, resigned.

Toledo, Kansas City & St. Louis.—W. J. Cook has been appointed Superintendent of Machinery, headquarters at Toledo, O.

Employment.

Wanted.—Situation as superintendent or manager of car works; or as master car builder or general foreman of railroad shops. Sixteen years' experience in charge of construction and repairs.

Address "Manager," care NATIONAL CAR AND LOCOMOTIVE BUILDER.